ELECTRICAL TIMES

THURSDAY
27 JULY
1950
SIXPENCE

B.I. Callender's

Mass-
Impregnated
Non-
Draining
CABLES for INDUSTRY

. . . are described in this new Publication No. 280v. Everyone concerned with industrial cable installations should have a copy.

Write for yours to-day.

BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2

Yes! Ask her. Ask your customer what she looks for in a cooker—in addition to the meat ration! B.N.E. asked Supply Authorities serving one and a quarter million consumers what they wanted, and incorporated their requirements in the Model C.49. As a result the specification includes more desirable features than have ever before been built into one cooker, not the least of them being the very attractive appearance . . . . . Send for full details now.

- ★ CAST-IRON MAIN FRAME AND HOB.
- ★ CONFORMS TO B.S. 1195 AND E.D.A. SPECIFICATION FOR INTERCHANGEABILITY.
- ★ VERY LARGE OVEN AND HOT-CUPBOARD WITH DROP-DOWN COUNTERBALANCED DOORS.
- ★ HOB AND OVEN EQUIPMENT DESIGNED FOR RAPID REMOVAL AND CLEANING.
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The B.N.E. Model C.49

The Cooker that has everything

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THE DOMESTIC APPLIANCES SECTION OF
JOHNSON & PHILLIPS LTD.
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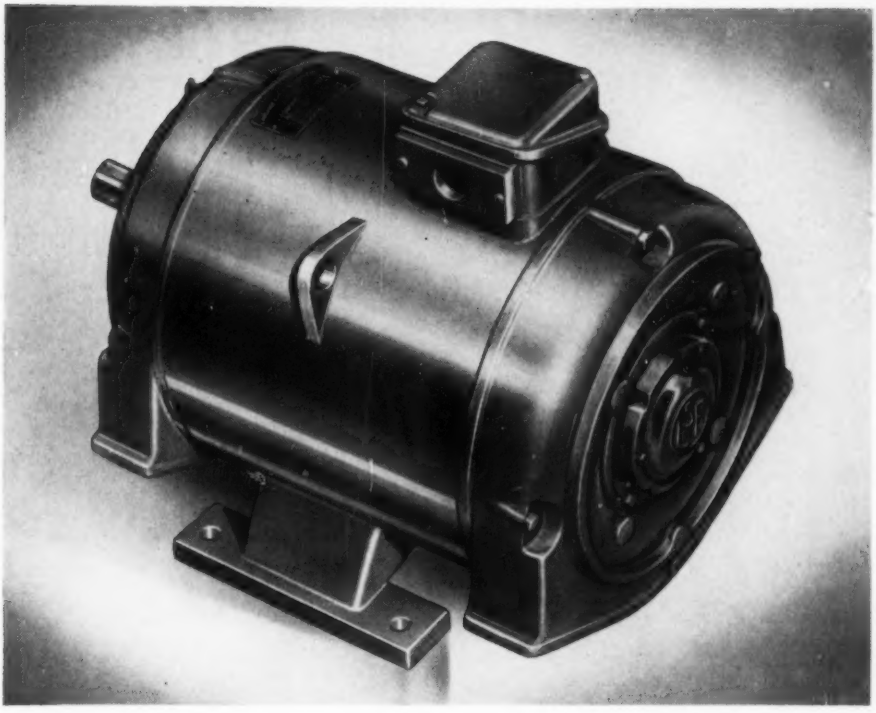

THIS IS A VERY GOOD MOTOR—

The standard screen protected squirrel cage motor is the machine by which the whole wide L.S.E. range is judged—and it is built accordingly.

It is robust and well protected, with an efficient cooling system. Its windings incorporate latest approved techniques of insulation, impregnation and test. It is available in a wide range of electrical and mechanical types, and many ratings are available promptly.

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A

"Popular" 4 FT FITTING

C E Co LTD
COMELCO
ENGLAND

N°496

A SOUNDLY CONSTRUCTED FITTING · TOTALLY ENCLOSED · FLUSH OR CHAIN SUSPENSION

LIST PRICE £3·10·0 (TUBE EXTRA)

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THE COMMERCIAL ELECTRIC Cº LTD
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PROTECTAFIL
SHOCK ABSORBER

TREBLES LAMP LIFE

Allows free swinging movement with floating balance

6/9 each

Highly recommended for fluorescent fittings
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WOVEN
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RESISTANCE NETS

COST SO LITTLE
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Write or telephone today for full details, and technical advice if required.

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The Cressall Manufacturing Co. Ltd.
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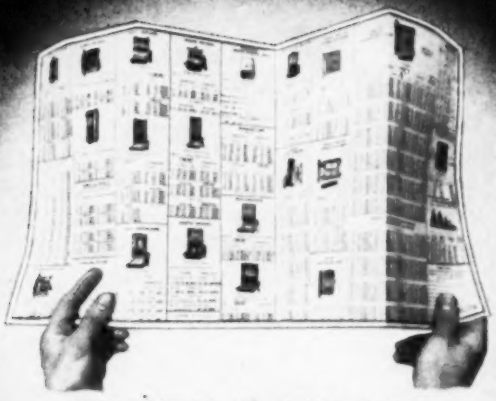

PUBLICATION Nº 450GL GIVES
CONSOLIDATED REDUCED PRICES OF
BILL SWITCH AND DISTRIBUTION GEAR

A COPY WILL BE SENT ON REQUEST

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NETHERLEE,
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PHONE: BIRCHFIELDS 5011. GRAMS. "BILSWITCH" BHAM

1912 - 1950

The Story of BELLING *& Company Ltd.* No. 9

In this same year, 1921, I notice in our catalogue a picture of the house I lived in at Enfield which was entirely *all electric*, and had been so for five years. I was able to give some very interesting figures of the cost to run the house. I used to use about 7,000 units per annum on the average, which at 1½d. a unit was about £45 a year. There were two very interesting pages showing how it was absorbed.

Chatting with Edgar Lee (the son of one of my neighbours at the above house) one evening, he told me he had just left the London University and was making wireless sets in his spare time, pending going out to Spain in business out there. They seemed to me to be very good little sets, so I naturally thought what about having a shot at making more of them. Anyway, instead of going out to Spain it resulted in our starting up a small company called Belling & Lee Ltd., which everyone in the wireless trade knows all about today. In addition to maintaining a leading position in a number of Radio and Electronic Components, we also have the biggest "Television Aerial" business in the country. It is only a week or two back we bought another fairly big works on the outskirts of Liverpool to cope with the ever-increasing demand. Mr. Lee is our active everyday Director here and what he does not know about interference suppression and signal pickup would be hardly worth knowing.

Talking about starting new businesses, many will be interested to know that Mr. C. H. Smith, who had been with us for some 4 or 5 years as Engineer and Works Manager, made up his mind to start in business on his own account, and in 1920 he left us, launched out with a partner, and started Heatrae Ltd. at Norwich. Although he started in competition I wished him every success, which as everyone knows, he has achieved, and what is more to the point still, we have always been and still are very good friends.

Back to Belling & Co. again, 1921 22, I find was a bumper catalogue full of fires, cookers and other small appliances, and sales went soaring.

This year we introduced our first "imitation coal fire." Two firebars at the front and on top a piece of glass, suitably moulded and coloured to represent pieces of coal. This was our list No. 985 fire, season 1921 22 catalogue.

1922 23. This season we again had a splendid catalogue, and our sales still kept rising rapidly. I notice also in 1923 I took out my first immersion heater patent. This enabled the element to be removed without breaking the water joint. We still make our immersion heaters on the same system, and have sold tens of thousands of them.

1923 24 season. Our catalogue was this year split into two parts. Fires for the winter season list, and cookers, immersion heaters, bath water heaters etc. for the summer season.

The next chapter tells of our move to still bigger works.

C. H. Belling

Belling & Co. Ltd., Bridge Works, Enfield, Middx. Tel.: Howard 1212

CRC9

The home of the

BRABAZON 1

Two views of the Assembly Hall, Filton, Bristol, showing the Brabazon I under construction.

(Photo by courtesy of The Bristol Aeroplane Co. Ltd.)

For the illumination of the Assembly Hall at Filton, Bristol, in which the giant aircraft Brabazon I was constructed, HOLOPHANE High-Bay Translucent Reflector Lighting Units were used throughout.

For the Runways, too, HOLOPHANE lighting equipment was specified — in this case, HOLOPHANE Directional Contact Light Fittings No. C.3A.

Specialists in Lighting Research and Application since 1896

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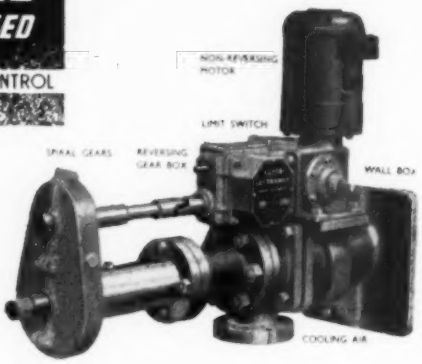
ELVERTON STREET, LONDON, S.W.1. VICtoria 8062 (4 lines)

Clyde SOOT BLOWERS
BOILER AVAILABILITY INCREASED

ELECTRO-MECHANICAL OPERATION with SEQUENCE CONTROL



IMPROVEMENTS OVER MANUAL OPERATION

1. **No physical exertion required.**
2. **Soot blowing carried out in a quarter of the time.**
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4. **Cleaner heating surfaces with higher and sustained rate of evaporation.**
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Clyde BLOWERS Ltd

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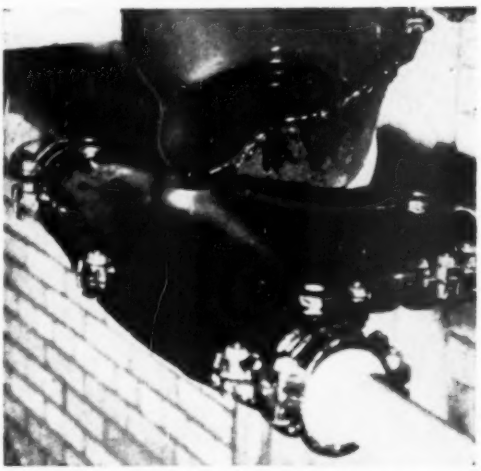
'Phone: CLYDEBANK 1576/77 *'Grams:* "MURWILS" GLASGOW

COMPOUND FOR USE IN HIGH TEMPERATURES . . .

"KINGSNORTH" Compound No. 318. Manufactured to Admiralty specification, for use in boiler rooms and places of similar constantly hot conditions. Complies with British Standard Specification 688 (Class V) and 803 (Type 2).



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Electrical Filling & Sealing compounds

★ *WRITE FOR NEW CATALOGUE ON "KINGSNORTH" COMPOUNDS*

BERRY WIGGINS & CO. LTD., Field House, Breams Buildings, Fetter Lane, London, E.C.4 **HOL. 0941**

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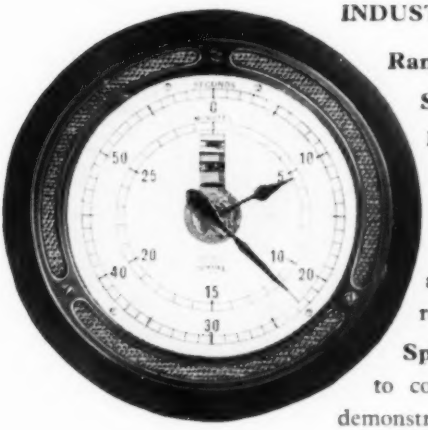
TIME INTERVAL METERS

FOR THE ACCURATE MEASUREMENT OF TIME



INDUSTRIAL TIME INTERVAL METER

Ranges. 1 sec. up to 30 mins. in two models.

Scale. 16in. long, with two concentric pointers.

Drive. Synclock mains driven motor for any specified normal frequency.

Control. From external switches to suit any control scheme: hand or electrical reset.

Special Models. (a) with mechanical drive to count revolutions. (b) with large dial for demonstration or process control.

THE PRECISION TIME INTERVAL METER (not illustrated) is a portable pattern of higher accuracy and with shorter scale (1/20th—10 secs.)

Send for Sheet 267E

EVERETT EDGCUMBE

Makers of Electrical Instruments indicating, recording and controlling; Photometric apparatus; process controls.

COLINDALE WORKS, LONDON, N.W.9. TEL: COLINDALE 6045

DH8

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EASTERN AVENUE, WOODFORD Lancaster fittings, 400 watt horizontal Mercury lamps—demonstrating planned controlled cut-off lighting, even distribution, good definition of objects and kerb.

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HOUSE SERVICE METERS

CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, W.C.2
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FIT MEM-AC AND DO THE JOB HANDSOMELY

The 'Mem-ac' is the best looking domestic switch-fuse you ever saw. It's not only beautifully finished but a precision job throughout. Less than half the size of most units of similar rating, it is every bit as sturdy and reliable. The double-pole slow break switch controls 30 or 60 amps.* with ease. Solid silver switch contacts are visible and accessible. The cartridge fuse can be renewed in 5 seconds without tools and without exposing live contacts. And you can get prompt delivery now.

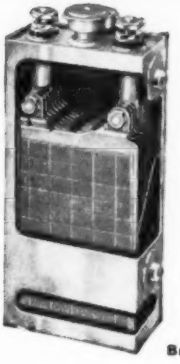
**** 'Mem-ac' switch-fuse for single Pole and Neutral, AC only, made in 15, 30 and 60 amp. ratings. 'Mem-ac' switches for 30 and 60 amps.***

MEM

Switch, fuse and motor control gear, electric fires and localised lighting equipment

MIDLAND ELECTRIC MANUFACTURING CO. LTD., TYSELEY, BIRMINGHAM 11

Branches in London and Manchester



As resilient as a springboard, the Alklum Steel-Alkaline Battery recovers immediately the 'load' is removed. Sturdy construction fits it for service under the most difficult conditions. Its compactness suits it particularly to every job where saving space is important. For maximum service with minimum maintenance costs it's an Alklum Battery every time.

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MERSEY CABLES

All Sizes of rubber insulated wires, cables and flexibles are made under the famous MERSEY name. *Illustrated is a 7/.036 Twin Circular V.I.R. Insulated, Taped, Tough Rubber Filled and Sheathed, Taped, Bedded, Single Wire Armoured, Jute Braided and Compounded 250 volt Grade Cable. To B.S.— No. 7/1946.*

Suitable for use in Mines and Quarries.

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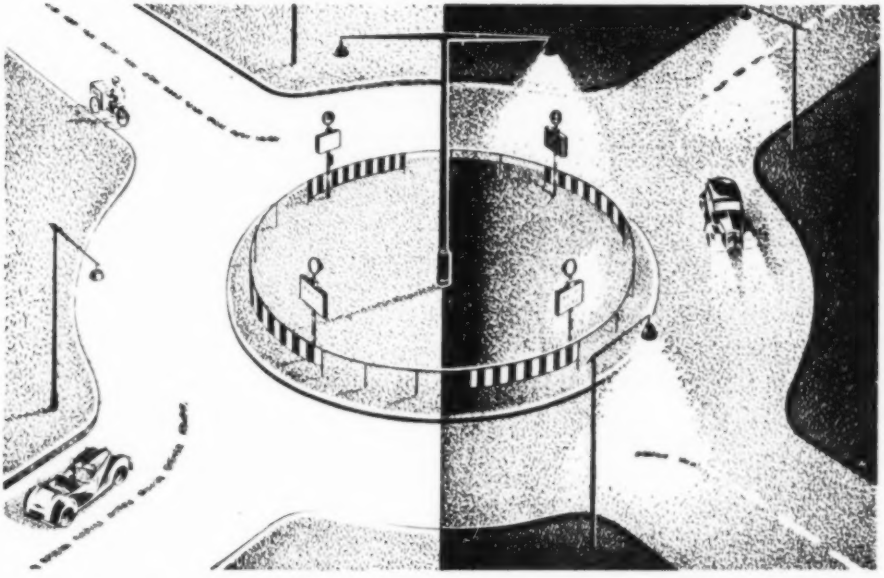
Manufactured by MERSEY CABLE WORKS LIMITED, LINACRE LANE, BOOTLE, LIVERPOOL. BOOTLE 2777-8-9

A COMPANY

A NEW DEVELOPMENT IN AUTOMATIC LIGHTING CONTROL



● MAGNETIC AMPLIFIER—HAS NO VALVES ● NEVER NEEDS ADJUSTING OR RE-SETTING ● REDUCED MAINTENANCE COST

Elliott photo-electric switching cuts the labour cost of street lighting—lights up whenever daylight fails, in good time, every time. Absolutely reliable, even after supply cuts, and needs no attention. Outstanding features include sealed barrier-layer photo-cell and robust, weather-proof magnetic amplifier.

Low impedance circuit puts no limit to distance from cell to control unit and simplifies installation. Mercury switch eliminates contact troubles. Switching capacity 2 KVA.

Extended field tests have proved the value of the Elliott Controller, especially for traffic signs on isolated sites. Automatic illumination in fog or dark conditions is a vital safety measure.

ELLIOTT

AUTOMATIC LIGHTING CONTROLLER

Ask for publication G033A

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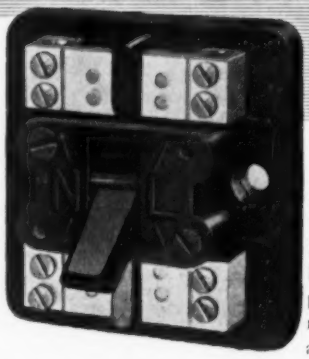
THE SWITCH WITH TOTALLY ENCLOSED CONTACTS



TOTALLY ENCLOSED CONTACTS prevent dirt and foreign matter causing failure to make circuit. Clear ON and OFF Indication; compact size; attractive finish. **Easy Wiring** — allows for front or back entry in the one Switch.

"WYLEX" — the Original Slow-Break Floating Bar Action — still the most up-to-date.

More and more Buyers are specifying "WYLEX" Switch, because of its high safety margin—proved by nearly a million installations; and by severe Lab. Tests (*ask for Report*).

WYLEX 30-AMP DOUBLE POLE SWITCH

Write for leaflet to: GEORGE H. SCHOLES & CO., LTD.
WYLEX WORKS, WYTHENSHAWE, MANCHESTER

Easy to handle... **Secomak** REG°

NEW MODEL 51 INDUSTRIAL VACUUM CLEANER

Unique design makes this, weight for size, the most economical and powerful portable Vacuum Cleaner available. One-man operated, it is built for easy manipulation in confined spaces.

- Approved by Factory Inspectors.
- Universal AC/DC power unit 1,200 Watts.
- 110 lbs. weight.
- Generous size pneumatic tyres.
- Large capacity internal dirt container.

Send for Data Sheet 103/50/ET.

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SECOMAK WORKS · HONEYPOT LANE · STANMORE MIDDLESEX
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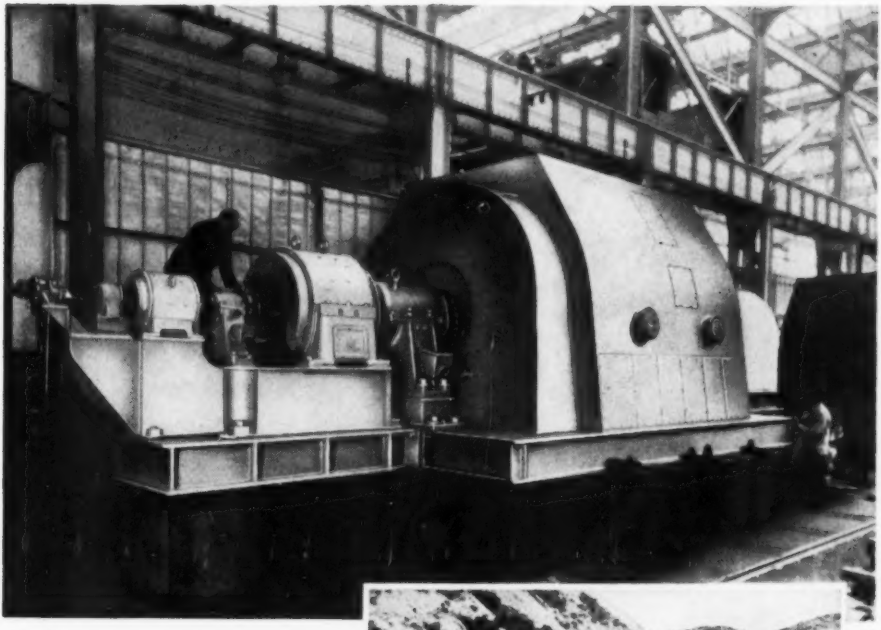
Hydro-electric Equipment



One of five 30,000 kVA., 750 r.p.m., 11,000 volt synchronous condensers supplied to the New Zealand State Hydro-electric Department. Two more are on order.

Stator of one of the above condensers during its journey in New Zealand from the docks to site.

For all plant required for
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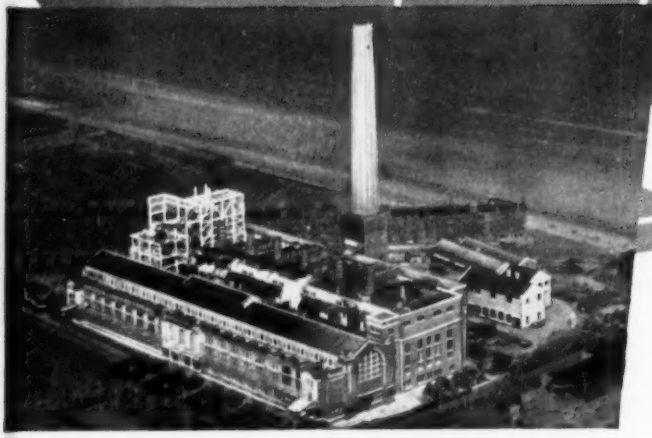
—Consult BTH

BRITISH THOMSON-HOUSTON
THE BRITISH THOMSON HOUSTON CO LTD RUGBY ENGLAND

P & G BATTERIES in the public service



Behind a number of Britain's large scale enterprises lies the quiet efficiency of P & G Batteries. The generation of electricity is a case in point. The Portobello Power Station at Edinburgh (shown here) employs P & G Stationary Batteries for Switchgear Operation, Emergency Lighting and other duties. Portobello is one of many. P & G service extends into many fields and covers complete specifications for any battery installation you care to name, a second and impartial opinion on an existing scheme, the provision of equipment and its installation, regular inspection and report. We welcome discussion on any project on the sound principle that two heads are invariably better than one.

2 *heads are better than* **1**

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50 GROSVENOR GARDENS LONDON SW1

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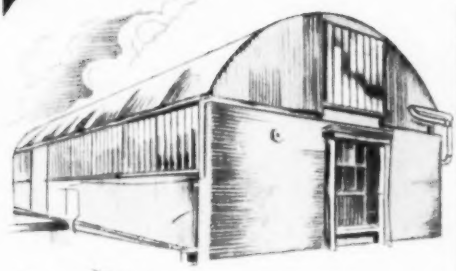


Cherry's Shop 1875

To allow for the extension of the aluminium sheathing plant to meet the unexpectedly rapid growth of demand for

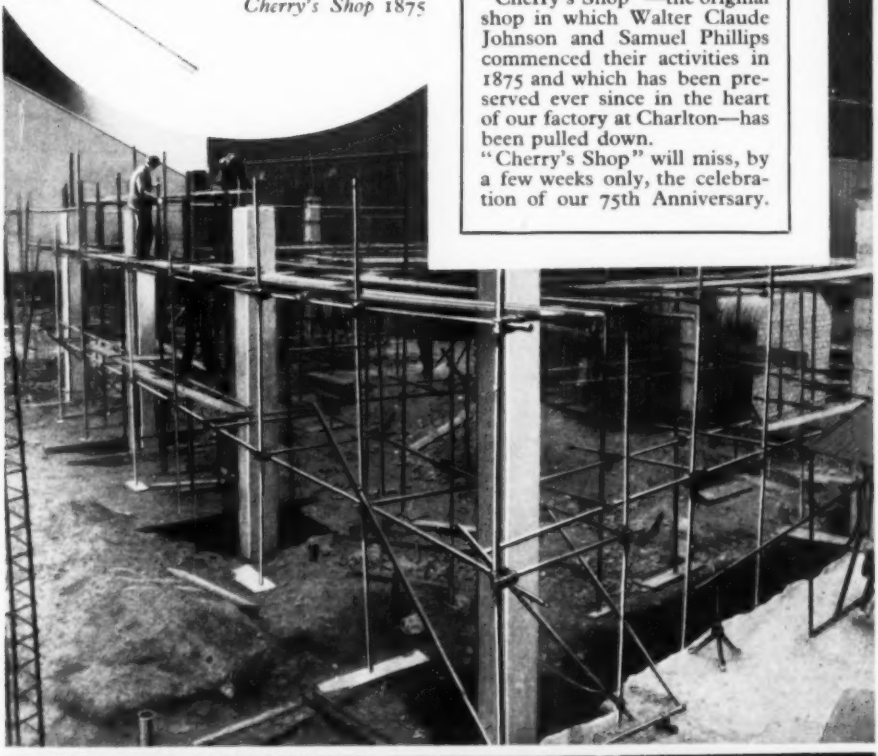
J.&P.

ALUMINIUM SEAMLESS

SHEATHED CABLES

BRITISH PATENT NOS. 627815, 627793

"Cherry's Shop"—the original shop in which Walter Claude Johnson and Samuel Phillips commenced their activities in 1875 and which has been preserved ever since in the heart of our factory at Charlton—has been pulled down.
"Cherry's Shop" will miss, by a few weeks only, the celebration of our 75th Anniversary.



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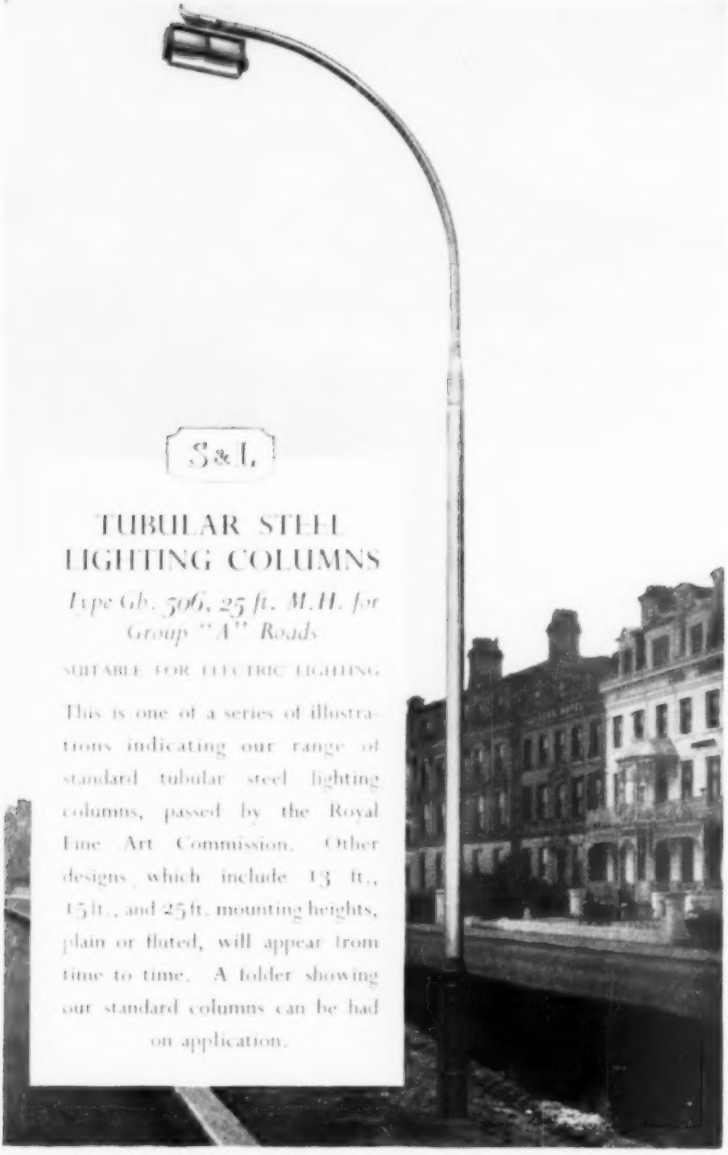
CHARLTON LONDON S.E.7
The mark that means that "little more" in quality



S&L

TUBULAR STEEL LIGHTING COLUMNS

Type Gb. 306. 25 ft. M.H. for Group "A" Roads

SUITABLE FOR ELECTRIC LIGHTING.

This is one of a series of illustrations indicating our range of standard tubular steel lighting columns, passed by the Royal Fine Art Commission. Other designs, which include 13 ft., 15 ft., and 25 ft. mounting heights, plain or fluted, will appear from time to time. A folder showing our standard columns can be had on application.

STEWARTS AND LLOYDS LIMITED
GLASGOW · BIRMINGHAM · LONDON

Talking about
MAINTENANCE

If all cookers were

Jackson

ELECTRIC COOKERS

maintenance work would have no future for us!

The Jackson Cooker is such a first class engineering job that it demands absolutely minimum attention where maintenance is concerned. In several areas there are many " 20 Series " Models — made in 1922 — still on circuit. — Think of it, 27 years of daily service! In 1939, of all cookers sold, over 40% were Jackson. To-day, as always, the Jackson ' Cleanline ' series still serves the engineer faithfully. The solid cast iron and heavy gauge steel construction — the design of the oven and elements which permits an amazing food capacity for an oven of its size — the quality of the vitreous enamel, which is second to none — all combine to make a Jackson the obvious choice for Hire and Hire Purchase Schemes. Low in maintenance cost — low in fuel consumption and thoroughly perfect in cooking. Ask any Maintenance Engineer who has thousands to look after and you will learn why Jackson have made and ***sold over half a million cookers.*** *Supplied in three attractive colours, mottled grey, mottled green and two tone ivory. The ' Cleanline ' series complies with E.D.A. interchangeability and specifications.*

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Cost A LITTLE MORE *Last* A LOT LONGER

It is true that PYRAMID cost a little more than ordinary aluminium utensils, but then, there never was anything quite the equal of PYRAMID aluminium ware for hotplate cooking. PYRAMID utensils are specially manufactured with quarter inch thick bottoms; they are solid drawn in steel dies, and their thickness and quality cannot vary. They are scientifically ground by a special process to give a dead flat surface and are so constructed that distortion is avoided. Consequently, PYRAMID utensils continue to give "all over" contact with the hotplate, and so save electricity, for years after their cost has been forgotten.

PYRAMID ALUMINIUM WARE

HAGUE & McKENZIE LTD., PYRAMID WORKS, BIRMINGHAM 1

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Milestones!

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1933. Our installation for Messrs. Brush Elec. Eng. Co. Ltd. for Commercial Motor Vehicles was generously described and illustrated in the Home Office Manual.

19.. The years following bring added lustre to the name of Aeraspray in this as in all other branches of Spray Finishing.

1949. We here show one of the Spray Booths 38 ft. long x 14 ft. wide x 20 ft. high for Public Service Vehicles at the works of Messrs. Saunders Engineering & Shipyard Ltd., Beaumaris. Our responsibility included Inlet Filters and Heating.

Spray Booth: Messrs. Saunders Engineering & Shipyard Ltd.

MAKERS OF SPRAY GUNS, SINGLE AND MULTI-STAGE AIR COMPRESSORS, FUME EXHAUST SYSTEMS, SEMI AND FULLY AUTOMATIC SPRAY FINISHING SYSTEMS

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Also at London, Glasgow, Manchester, Belfast and the Principal Cities of the World

Contractors for every class of building and civil engineering work at home and overseas

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P.V.C. Insulated

Accurately extruded to ensure concentricity

Sole Manufacturers :

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FELTHAM *Telephone : Feltham 3453-6* **MIDDLESEX**

For bases, plugs, sockets, and
all moulded electrical components

specify

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NON-TRACKING

moulding powder

Mouldings made from Scarab moulding powder have good dielectric strength, good insulating and high non-tracking properties.

Scarab is inexpensive, easy to mould and offers a wide choice of colour. A special *plasticised* grade with a low after-shrinkage factor is produced for moulding over heavy inserts: mouldings from this material resist variable climatic conditions, and are suitable for export to hot, dry climates

Write for Technical Leaflets.

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Standard Scarab Moulding Powder complies with BS.1322, Type U.

Distributed by

THE BEETLE PRODUCTS COMPANY LTD

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THERE HE STANDS—symbol of authority in an orderly World—controlling—directing—obeyed because absolutely trustworthy and reliable.
What a fitting comparison with BIRCH RESISTANCES, *Arms of the Ohm's Law.*
Backed by many years of practical experience in which their reliability has been tested under all conditions, BIRCH RESISTANCES, in their various applications, stand up to their job and can always be depended upon to provide specified service because of their first-class workmanship.

Birch

Registered Trade Mark

Please call upon us to help you solve any Resistance problem.

Resistances

May we quote you for any of the following :—

DIMMERS—REGULATORS (Field, Shunt, Voltage)—RESISTANCES (Arc Lamp, Charging, Regulating, Sliding)—RHEOSTATS—ELEMENTS and SPIRALS—Asbestos Woven Resistance Nets and Grids.

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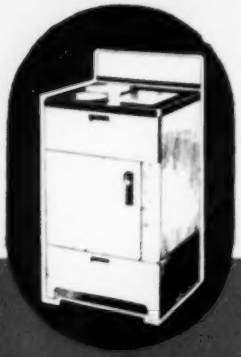

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ALL-INSULATED COMBINED SWITCH AND CONSUMERS' SERVICE UNIT

Type F3081/2T

TWO METER ARRANGEMENT

Showing the New Combined Unit, fitted with two switches and having split bus-bar, coupled to a standard All-Insulated Service Cut-out No. 2985 and Meter Lead Covers.

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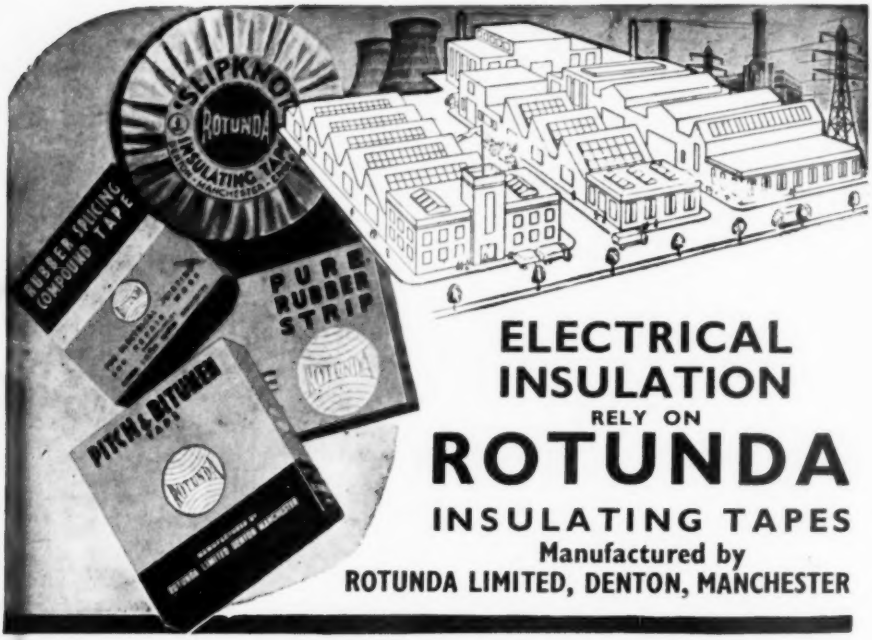

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INSULATING TAPES
Manufactured by
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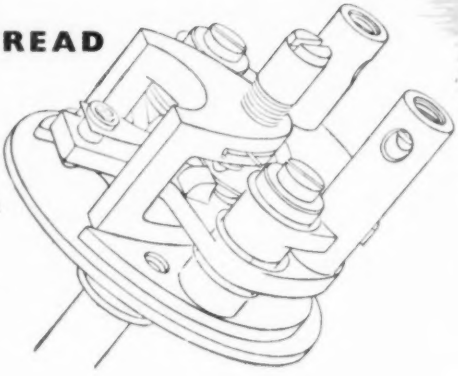
HANGS ON A THREAD

Once it's happened you bear it—but what *might* happen always nags a bit. Those screw contacts hidden away in a water-heater thermostat, for instance? *In the Sunvic we make the electrical circuit all-in-one.* And the little switch that toys with your reputation perhaps 10,000 times a year? *Nice to remember it's that positive-action* SIMMERSTAT *type.* Creeping calibration can be another good-will nibbler — but, again, *not with Sunvic.* Prices are now reduced.



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Sunvic Controls Ltd., 10 Essex Street, W.C.2

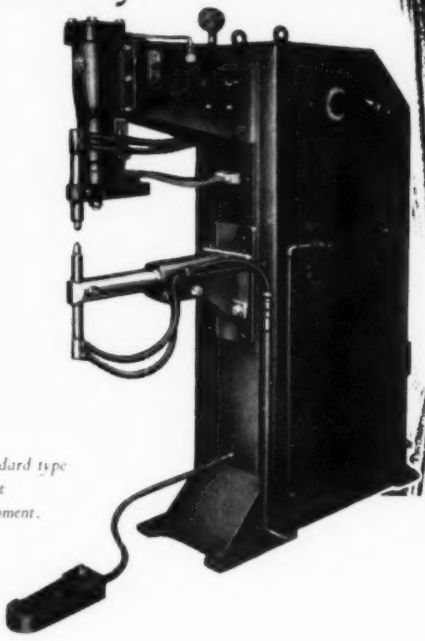
The WATER HEATER THERMOSTAT
with the positive-action switch.

SUNVIC

Domestic temperature controls

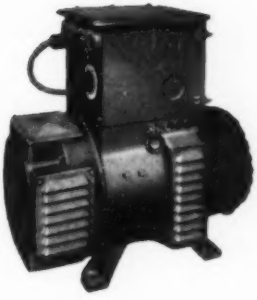
TAS SC 247

M-V Welding Plant is built by welders



Metrovick standard type AS 60/24 Spot Welding Equipment.

It is a fact that Metrovick have one of the biggest welding shops in the country and have pioneered the use of welding in the construction of giant electrical equipment. The results of all this practical experience are incorporated in the design and construction of the whole range of M-V welding plant. Resistance and arc welding equipment is produced by M-V, who have also developed atomic hydrogen welding for special applications. For information on any aspect of welding ask Metrovick, the makers who use the plant they sell.



A Metrovick Paradyne Arc Welding Set—available in two sizes 300 ampere or 400 ampere maximum.

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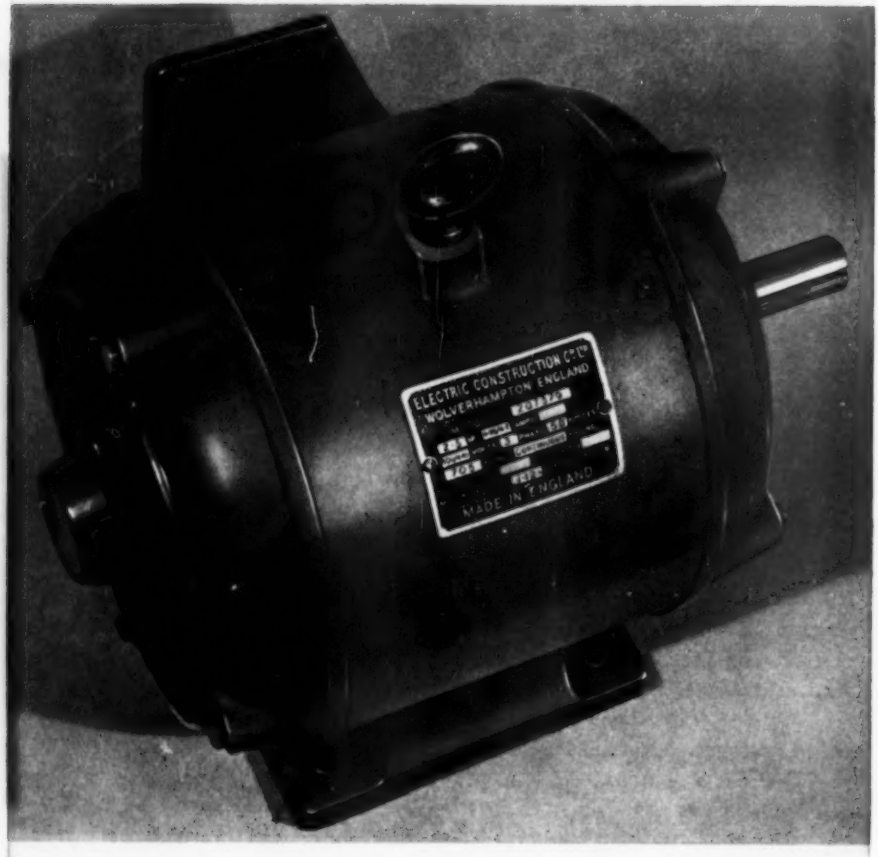

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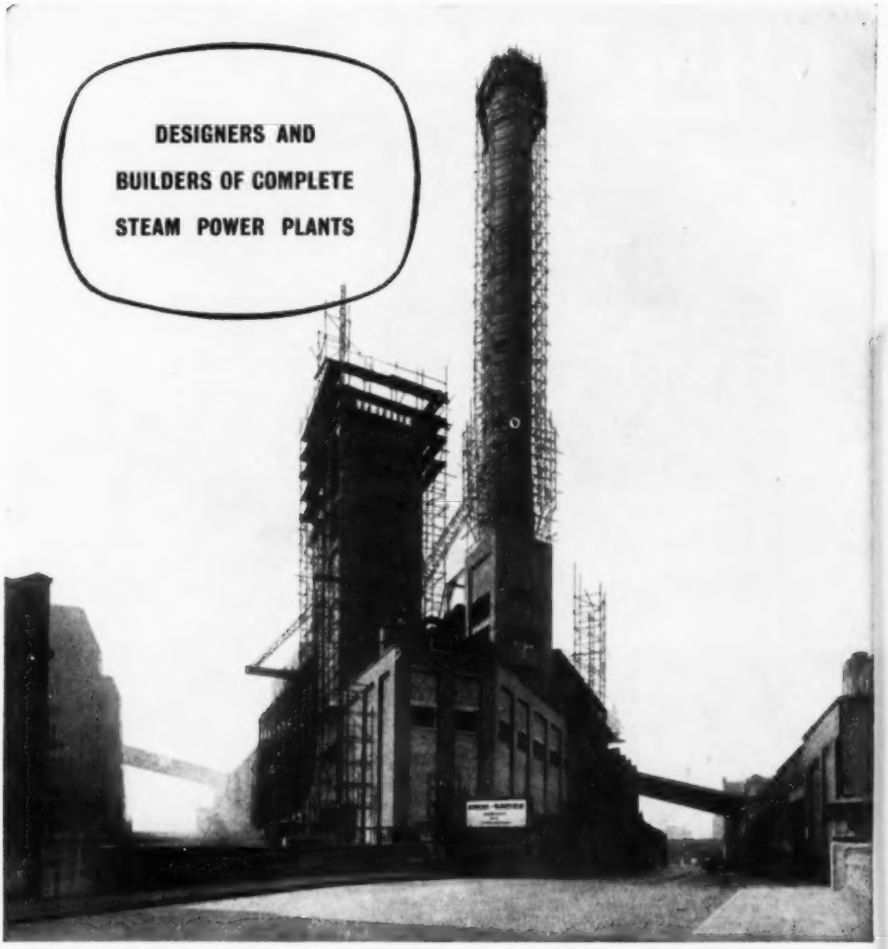

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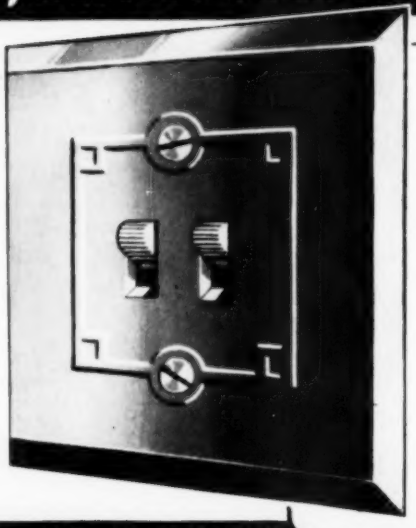
The photograph shows a typical contract nearing completion for Messrs. Tate and Lyle Ltd. in Liverpool. This contract includes the demolition of existing buildings; excavations for reinforced concrete foundations, and the design and construction of a steel-framed brick-filled building and reinforced concrete chimney; pneumatic coal intake plant and four stoker-fired boilers each generating 72,000 lbs. of steam per hour at 650 lbs. per sq in. and 750° F; ash handling plant, water treatment plant, space heating equipment, electric motors and starters, cabling and wiring.

CUMBRIAN
Tumbler Switches



The new Cumbrian range of Switches (flush-surface-semi-recessed) have been tested by the National Physical Laboratory with commendable results.

They incorporate many famous features, such as single or double switches in same size 1299 box; one way or two way types; simple assembly in box which allows 5° alignment of switch.

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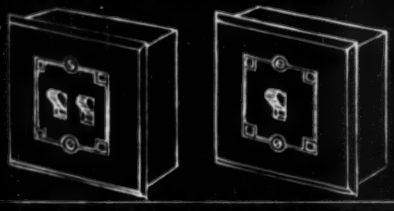
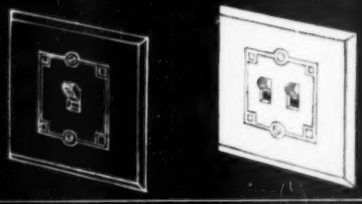
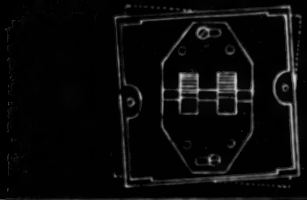
SINGLE OR DOUBLE SWITCH IN SAME SIZE B.S. 1299 BOX



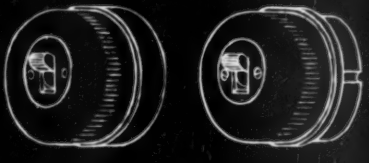
BROWN OR IVORY FINISH



SLOTTED MOUNTING BRACKETS ALLOW 5° ALIGNMENT OF SWITCH



SURFACE AND SEMI-RECESSED TYPES



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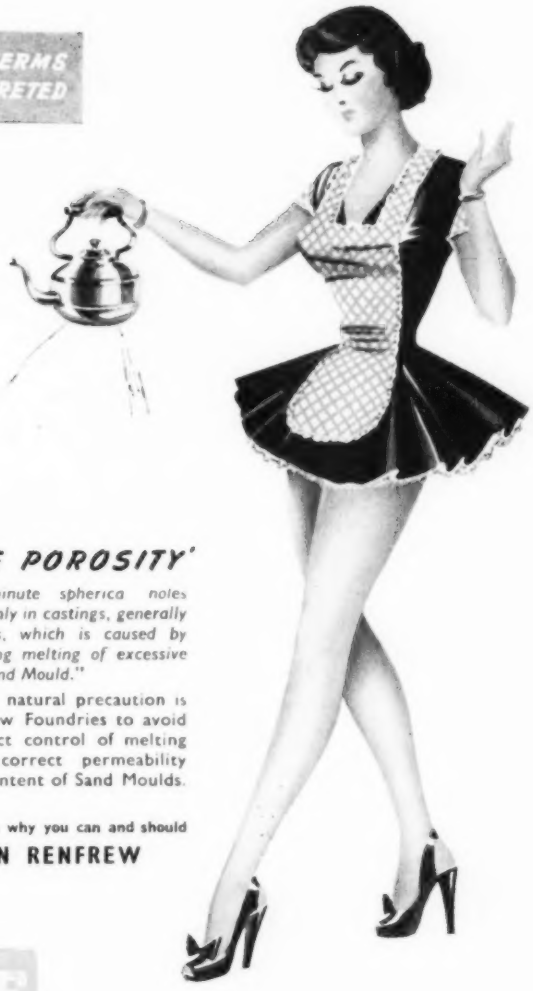

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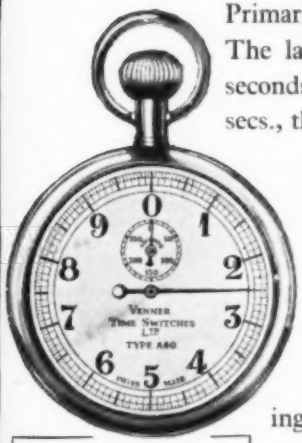
VENNER MASTER PENDULUM CLOCK

VENNER STOP WATCH, TYPE 'A40'



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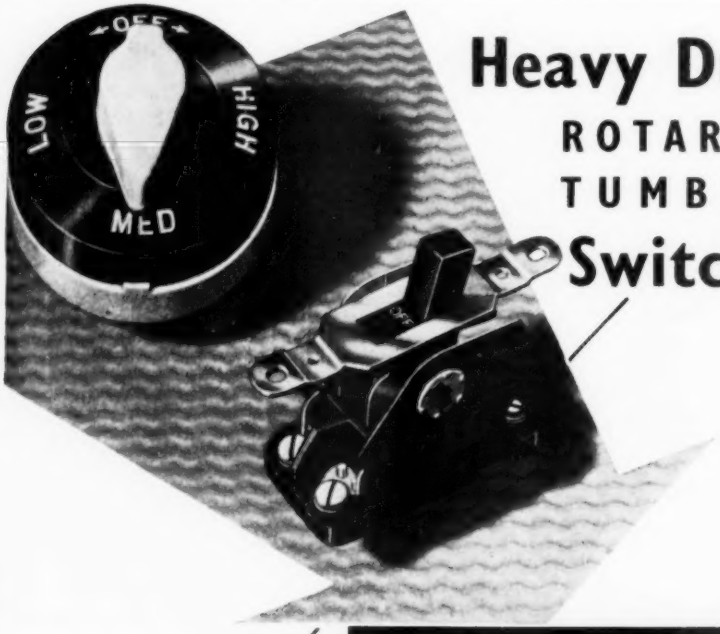

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Three Heat

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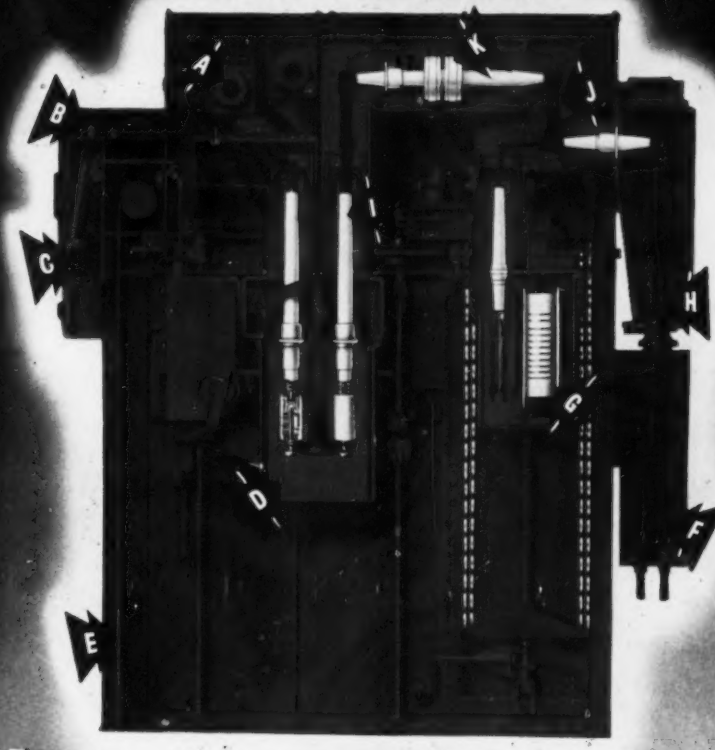
The finer points of SWITCHGEAR DESIGN



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A Condenser bushing busbars
B Continuous trunking for bus wiring
C Door giving access to the ancillary apparatus
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E Roller shutter enclosing front of the unit
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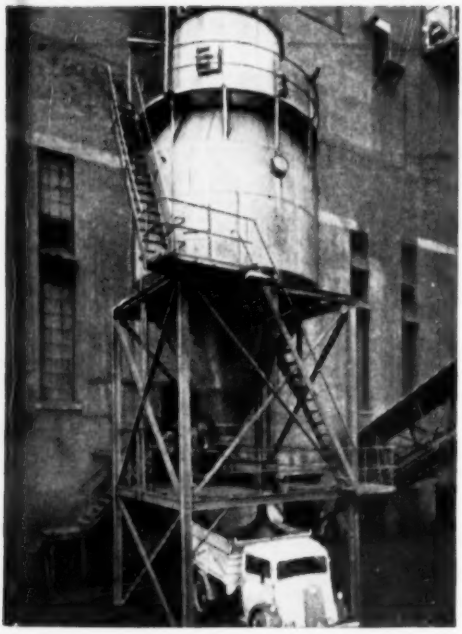

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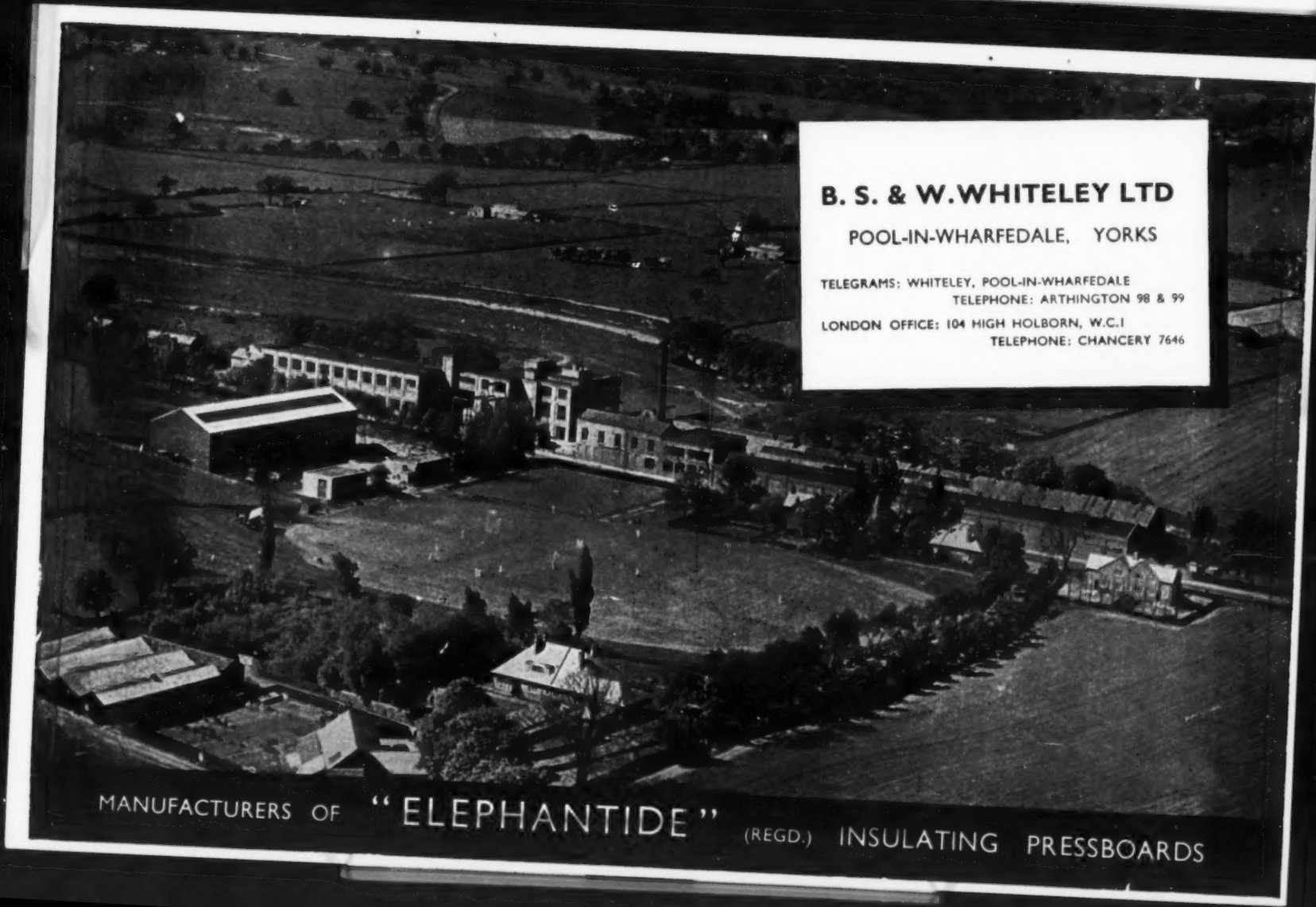
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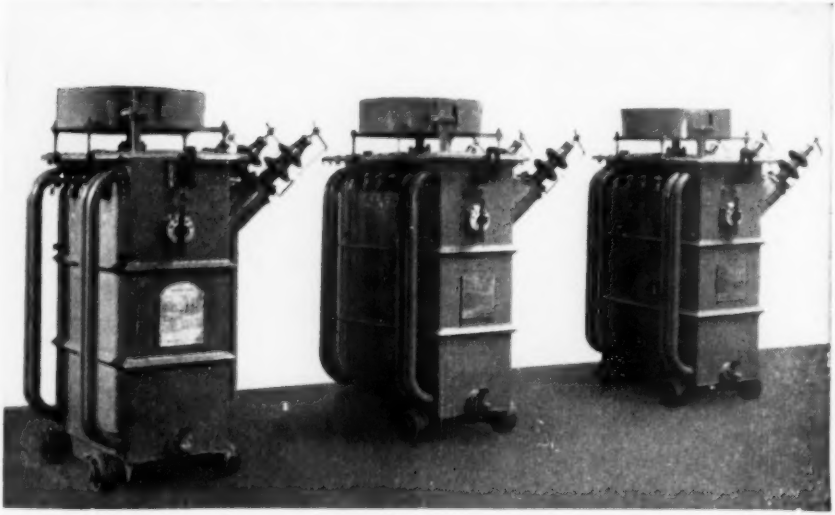

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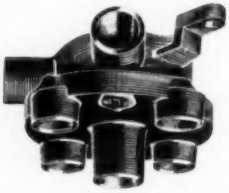

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for use at all intersection points of flameproof conduit systems
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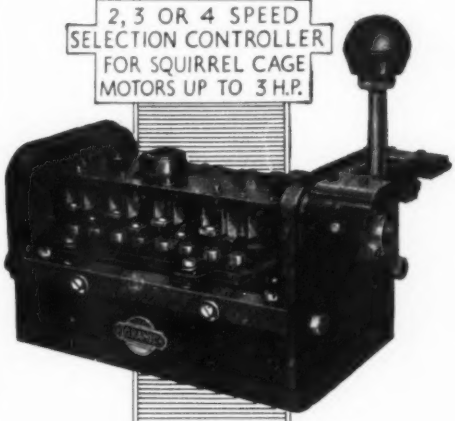
Electric Control Gear



This switch — Catalogue No. 85265 — is designed for the starting and speed control of two-, three-, or four-speed squirrel cage motors up to 3 h.p. 230/550 V. It is also suitable for larger motors up to 7½ h.p., 340/550 V if used in conjunction with a suitable starter.

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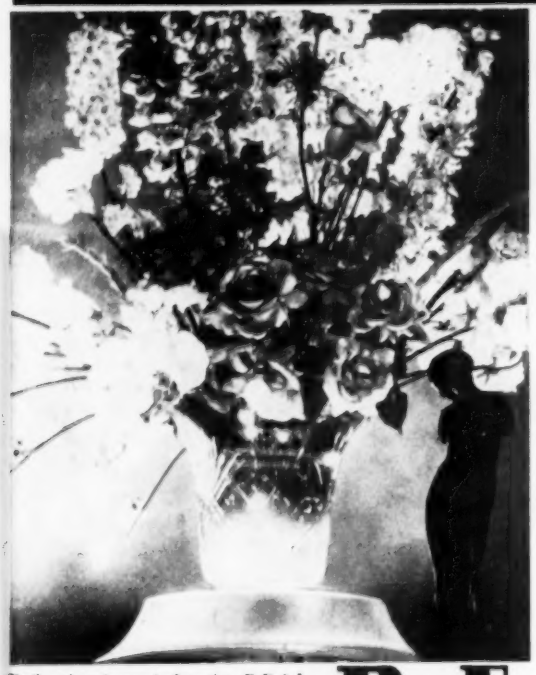

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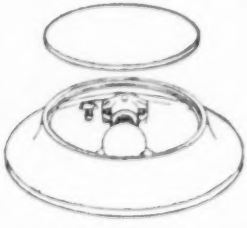

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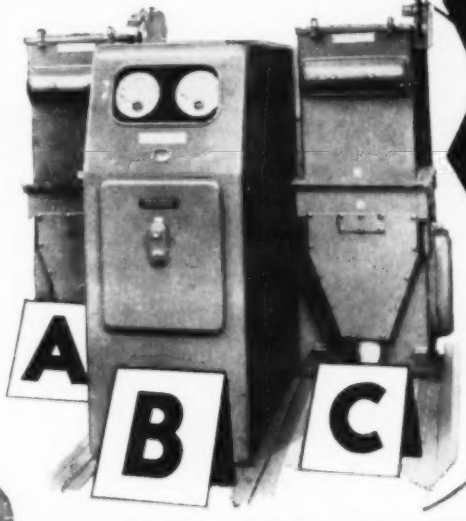

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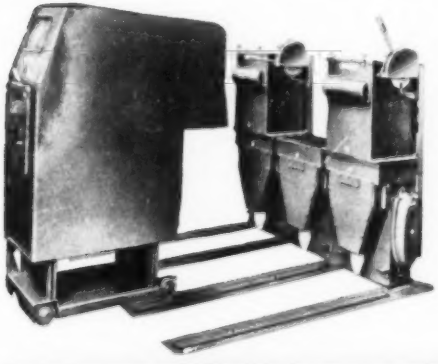

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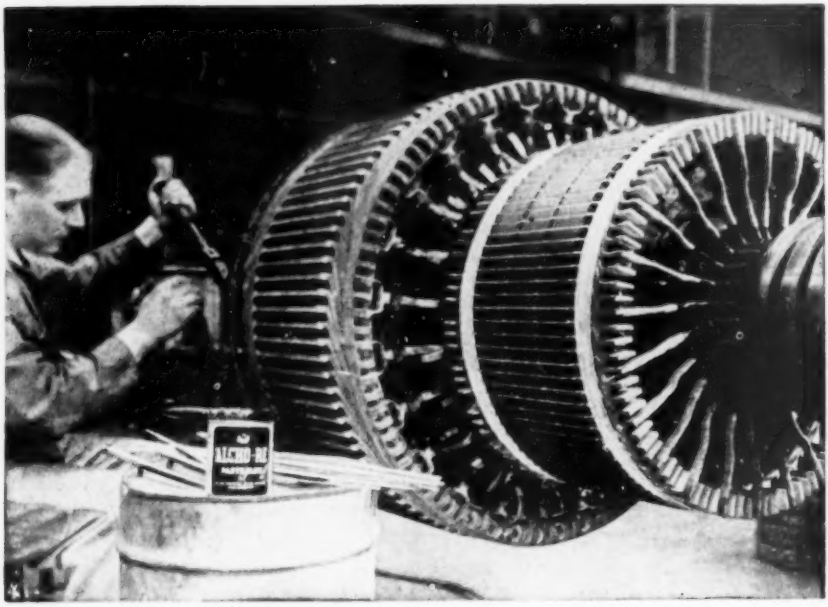

Photograph by courtesy of Messrs. Dowding & Mills Ltd., Electrical Engineers, Birmingham

FMF

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FRY'S H.T.3 high temperature solder

and Alcho-re Paste Flux

The illustration shows a 500 K.W. rotary converter armature with auxiliary rotor. All joints have been soldered with Fry's H.T.3 high temperature Blowpipe Solder in conjunction with non-corrosive electrical "Alcho-re" paste flux. Further information on Fry's high temperature solders and non-corrosive electrical fluxes is given in Technical Leaflets No. 5 and No. 51 respectively. Fry's Technical Department is fully at your service to advise on all problems connected with soldering.

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ELECTRICAL TIMES

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Editorial

FOUR FIGURE YEAR?

HALF WAY through the plant year finds the B.E.A. with 380 MW of new generating machinery to its credit, together with about 450 MW of boiler plant. This is some way below the 1,000 MW installed capacity/year rate of increase generally estimated for the Authority's plant, but comparison with the first half of last year promises at least a close approach to success, as both sets and boilers are up by some 11% in total capacity which has been commissioned. Applying this figure to last year's overall results, and thus assuming that there will be another commissioning sprint this autumn and winter, a total of 920 MW for new sets during the year is obtained. But forecasts are always uncertain things. Much depends on how bottlenecks are overcome. However, the horizon is brightening and auxiliary supplies of valves, etc., are scheduled this year from overseas. In any case the industry seems to be heading for a record in installed plant. When all that the manufacturers had to say at Harrogate on the subject of plant being available is considered, there does seem a good chance that four figures will be passed this year.

KILOWATTS OR HOURS?

WHICH is the better sales policy—to build load or to secure increased usage? The problem was discussed at some length at the Edison Electric Institute's Chicago conference by O. R. Doerr (Pacific Gas and Electric Co.), in a paper on the respective roles played by men and women in the industry. While he felt that men were more successful at actual selling of apparatus, the housecraft adviser was the person who could best secure the increased use of appliances already installed. Although he believed that it was essential to maintain balance between the two branches of activity, the potential load building by this latter method had immense possibilities. If each of Pacific's million domestic consumers could be induced to raise their consumption by as little as one additional unit per month, it would be equivalent to adding 12,000 cookers or 4,000 water heaters.

EASIER OVER THERE

TRANSLATING this into terms of the British scene, the picture conjured up of this increase in revenue without any additional capital expenditure, makes one's mouth water. Yet the problem presents additional complexities over here. To begin with, Mr. Doerr admits that it is too expensive to obtain increased usage by contacting consumers individually, and that it must be done on mass-production lines. Here we are at a disadvantage, in that the British housewife is not so gregarious as her American opposite number. She can be induced to come to cookery demonstrations —there have been some attendances which were almost embarrassingly large—but the idea of kitchen parties given by housewives to their neighbours is unlikely to prove so acceptable, and as British housewives are not naturally "joiners" the possibilities of spreading the message through women's clubs are not nearly so favourable in spite of the valiant efforts of the E.A.W. in this direction. In the second place, the American woman is much more "gadget-minded." She will own a number of appliances as a matter of course and the problem of inducing her to use them is comparatively simple. Here, we should first have to sell the appliances. Yet another fact is that the American woman will use her appliances without one eye on the meter. Any campaign by British housecraft advisers to make

the housewife use her cooker more could be successful—we refuse to believe that our housecraft advisers are not as clever as those in the U.S.—but it might bring repercussions when the bills came in, complaints that electric cooking was "dear." By all means let us work towards increased usage. But let us not lose sight of our main need, which is to get the cookers and water heaters installed in the first place.

THE PART OF WHOLESALERS

BEARING in mind the forthcoming Census of Distribution, information regarding the methods of distribution becomes of importance to all engaged in manufacture or commerce of any kind. On page 149 of this issue we review the section devoted to electrical goods of a recent investigation by the National Institute of Economic and Social Research, which carried out a survey into conditions existing in 1938. Whether, as the authors claim, 1938 is comparable with 1950 as a free economy is a point which would permit of an extensive—and inconclusive—debate. We cannot help feeling, however, that the conclusions drawn will give rise to much argument. A typical example is the review of the field of domestic appliances, such as fires, irons, toasters, kettles, and the like, where it is stated that only 25-30% reached the retailer *via* wholesalers, and 55-65% went direct from manufacturer to retailer. Yet this is the very type of merchandise which, it is always tacitly assumed in the trade, is mostly handled by wholesalers for the simple reason that the prices, and size of average orders, normally render it uneconomic for a manufacturer to undertake his own distribution. Further, the figures do not include direct sales to supply authorities, nor do they include vacuum cleaners, which are dealt with separately. Bearing in mind that the authors do not disclose details of the methods employed in making these investigations, we are reluctant to regard the figures given as an authoritative survey of the electrical industry, although they may serve as an approximate indication of the position occupied by the industry in the general pattern of retail distribution.

ELECTRICAL EXPORTS

DURING the early stages of the export drive the Electrical Times Export Index provided the only monthly guide to the progress of the consumer goods section of the industry towards the Government fixed target. That target was published principally to allow the necessary materials to be allocated from national resources, and, with the easier supply position now existing, such an estimate is no longer considered necessary. Continued effort in the export field, however, remains of first importance, and so we are maintaining our monthly graph as a measure of the electrical industry's achievement. As a new standard of comparison we have selected the previous year's results, and to fall in line with the recent Board of Trade modification we now use 1947 as the base year for price and volume calculations. The most important alteration which our readers will find on page 159, however, is the addition of a new graph showing the progress of electrical machinery exports, which the absence of an individual target figure made it impossible for us to include while the target scheme was in operation.

EXCELSIOR

LAST Sunday there appeared on Snowdon a banner with the strange device "Electricity without Vandalism." The occasion was the unveiling of a "Stone of Heritage" to mark the protest against the B.E.A.'s hydro-electric scheme, a ceremony performed by Lady Megan Lloyd-George. Appropriately enough, the ceremony took place in driving rain, but we doubt whether one of the several hundred present stopped to think of the power that was going to waste, or of the comfort it could bring, when properly harnessed, to those who have not the hardiness to enjoy climbing mountains in such weather. Nor was voice given to complaints from residents in the area of the spoliation of amenities by those lovers of Snowdonia who appear in hordes each summer in garb strange and alien spreading vandalism without electricity.

Meteor

Grid System Research

NEW B.E.A. LABORATORIES OPENED AT LEATHERHEAD

THE operation of a large interconnected system, such as the Grid, often brings to light problems of a nature unsuitable of solution by conventional research laboratories. The existence of these problems and the necessity of finding solutions, led the former Central Electricity Board to plan the setting up of a Research Laboratory several years before the war. In 1932 a small laboratory was set up at Waddon, near Croydon, and in 1934 a high-voltage insulator testing station was established at Croydon in order to study the performance of insulators operating under humid and dirty atmospheric conditions. The outbreak of war led to the transference of research activities to Horsley, and as the Waddon laboratory was badly bombed in 1940, some of the work which had been carried out there was transferred to Leatherhead, where the C.E.B. had a site available adjacent to the 132 kV transforming station.

Plans were then formulated for the building of comprehensive research laboratories on this site, and, with the coming into existence of the B.E.A., work was pushed rapidly ahead and culminated in the official opening of the laboratories by Lord Citrine.

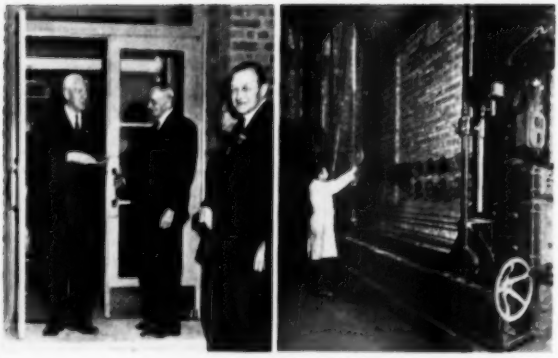
Speaking at a recent Press visit, Mr. Forrest emphasised that there was no intention of duplicating any work being done elsewhere, and also pointed out that the laboratories were not the final answer, although to date they had already given useful help in problems arising out of the supply industry. The future would undoubtedly see considerable expansion.

Sir Harold Hartley, chairman of the Electricity Supply Research Council referred to the importance of any big concern having its own research laboratories. Problems of operation often called for scientific research and the only people who could appreciate the problem were those who were actually engaged in the operational work. It was important to make the bond between the engineer and the scientist tighter and it was also necessary to have research laboratories immediately available. The Research Council had now been in operation for a year, and members of the Council covered a wide range of experience. They received problems from the Authority, and were enabled, because of their specialised knowledge, to state where the work could be carried out most effectively.

High Voltage Testing

Inevitably, a large proportion of the work is devoted to investigation on insulators and the study of insulating materials. For this purpose, a h.v. laboratory has been set up with equipment to provide impulse voltages up to 1,400 kV peak, power-frequency voltages up to 250 kV r.m.s. and d.c. voltages up to 200 kV. Cathode-ray oscillographs will shortly be installed for recording impulse and power frequency waveforms, and a Schering bridge enables power factor measurements to be made up to 250 kV. An unusual feature s that the instrument pointers and scales on

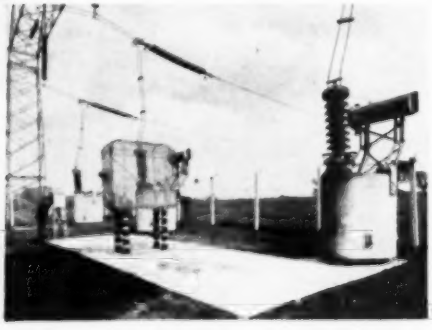
On the left is part of the low voltage laboratory. *Right is the well equipped chemistry laboratory*



Left, Lord Citrine performs the official opening ceremony. Right, insulator strain testing

the control desk are painted with fluorescent paint so that they may be read, with the use of ultra-violet light, when the remainder of the high voltage laboratory is completely blacked out. This permits visual observation of corona phenomena to be carried out. A bushing is provided through the wall of the building to allow for testing of insulator strings, etc. in the open.

Adjacent to the high voltage laboratory is the low voltage section. This department deals mainly with general electrical investigations and measurements. All the benches in this and the other laboratories are provided with built-in panels giving 3-phase 400 V a.c. supplies, 230 V single-phase socket-outlets and six variable d.c. voltages taken from a 120 V battery. An important feature of this particular lab. is the recording of electrical conditions of the Grid under normal operation and during faults, and in addition, significant meteorological data are recorded so that correlation between power system load and the weather conditions can be investigated.



Left, End of experimental 275kV line showing single-phase Ferranti transformers and Faraday Cage for Schering Bridge measurements

Electronic techniques have undoubtedly a great field of application in the general problem of power transmission, and in order to further the development of these techniques, a special laboratory is devoted to this subject. Work is in progress on v.h.f. radiocommunication, interference with television and radio reception, thunderstorm and fault recording systems, system protection and load control. In addition, this section is largely responsible for the equipment and instrumentation required for field tests.

An interesting development which is being pursued is the use of centimetric wavelengths for communication and relaying. The laboratory is equipped with various types of Duddell and cathode-ray oscillographs, harmonic analysers, frequency meters, equipment for noise and pressure measurement, time interval meters, and other standard instruments such as radio and audio-frequency oscillators. Typical of the work carried out is an investigation made into the pressure waves set up by the operation of air-blast circuit breakers indoors.

Other Sections

Other laboratories deal with the measurement of ultimate tensile strength of overhead-line conductors and joints, the study and assessment of conductor deterioration and the testing of materials in general. The testing machine used for conductors and joints can apply 24,000 lb. A physics section is available to deal with the general physical problems which arise, often from other sections, and is also responsible for providing a radiographic service, and a chemistry section is also available for general chemical work. This work at present is mainly confined to an investigation into the possible correlation between impurities in aluminium conductors and the rate of deterioration in service. In addition, the chemistry laboratory is participating in an international research programme on oil oxidation.

Our readers' views . . .

Fused Plugs?

WHILE the advantages of fused plugs are being stressed, and consumers are accepting their installation because of the saving in cost in cable and provision of fuse-ways in a distribution board, no mention is being made of their disadvantage as compared with the installation of unfused plugs and sockets. The disadvantage to which I refer is this: whereas fuses provided in a distribution board can always be rewired, there is no guarantee that even, say, in five years time replacements for the cartridge fuses in the present-day types of fused sockets will be obtainable, such is the rapidity of change in design.

R. A.

BOLTON.

• • •

The Cooker Position

REGARDING your two articles on "The Cooker Position" in your June 22 issue, there is a third viewpoint—the consumer's—which is apt to be overlooked. I find from long experience that the consumer's needs are neither cared for sufficiently nor so efficiently as might by now be expected.

Women need a cooker with a minimum of two or three hotplates so perfectly fitted for the purpose of cooking as to be the best possible tool for that purpose. Cooking is an accomplishment that, perhaps beyond all others, needs encouraging by the provision of the best means for doing the job. Electricity alone has the power completely to meet the needs and do the deeds of the cook.

An electric hotplate well controlled can give quick switch response, precision, repeatability and reliability with uniformly spread heat and an economy scarcely dreamed of.

We must, however, bring home these advantages. Failure of hotplates should be as rare as snow in June. To say, "I guarantee my hotplate for a year or two," or "I send and replace a hotplate immediately" emphasises inherent weakness. The customer has suffered maybe loss of a meal or valuable food *and* "workmen in the house"!

The time is past for primitive self-satisfaction on the part of either manufacturer or supply authority. We all need to see the consumer's side—first, last, and all the time. A hotplate should, of course, be radiant for quick transfer of full heat from element to utensil, but the lower and lowest temperatures most needed for long-hour cooking call for well-spread heat or warmth! Simmering temperatures vary from 165° F. downwards. "Bubbling" or "just bubbling" may be much too much—ask any competent chef about saucemaking. Given hotplate efficacy, the financial savings, economy in electricity and maintenance are almost beyond credence—enough to repay the initial cost of the cooker every five years, I should say.

To sum up, the electric cooker must keep on cooking indefinitely, not for a year or two; must cook better than any other agent—and it can; must cook most cheaply—and it can; must be well shown, demonstrated and *demanded*.

Dorothy Mayne

HANWELL

• • •

An Error Corrected

SOME of the figures relating to the telephone system given by "Meteor" in the issue dated June 29, 1950, are incorrect. In quoting the figure of 65,317 "Meteor" has apparently taken figures for a recent quarter instead of those for a full year.

The total number of telephones in use in 1923 was 1,050,672, while in 1950 it was 5,171,491. New telephones installed numbered 135,000 in 1923 (giving a net increase of 74,356) and in 1950, 540,000 (net increase 252,000).

You will see that the number of new telephones being installed in 1950 is four times as great as in 1923.

An indication of our post-war effort is given by the fact that as many telephones were installed in the four years following the end of the war as in the eight years preceding it.

A. Prodgers

GENERAL POST OFFICE,
PUBLIC RELATIONS DEPT.

Dynamic Braking of Induction Motors

A new method of calculating d.c. injection braking torques

By C. B. WYATT, M.I.E.E.

MANY drives, powered by induction motors, require some form of braking and, in such cases, dynamic braking may offer considerable advantages. It is frequently possible, on drives employing the dynamic method, to dispense entirely with brake drums and shoes. In other cases, a small friction brake is used for holding purposes only, after dynamic braking has reduced the speed to zero.

The methods most frequently employed for the dynamic braking of induction motors are (*a*) by reverse current excitation or "plugging," and (*b*) by d.c. injection. These two methods will be considered separately and their characteristics compared.

Plugging

This well-known method may easily be understood by consideration of the familiar elementary circle diagram of the polyphase induction motor, Fig. 1 (for simplicity, small effects such as motor iron loss, friction, and windage are ignored), where the output and torque lines are drawn for the short-circuited rotor condition and n = motor r.p.m. The conditions of motor standstill and synchronism are represented by $n = 0$ and $n = n_s$ respectively. Plugging at synchronous speed then corresponds to the point $n = -n_s$ (the rotation of the rotor being backwards at this point, synchronous speed taken as positive). Other torque and output lines may be drawn in the usual way, corresponding to various values of rotor resistance resulting in the well-known family of speed/torque curves shown in Fig. 2. In the case of slip-ring motors it is therefore

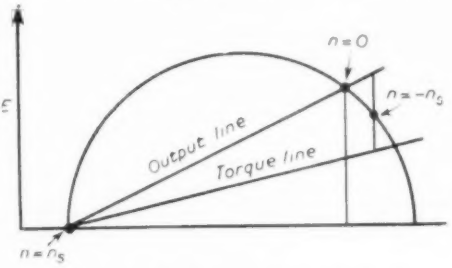


Fig. 1. Induction motor circle diagram

possible to obtain a wide range of braking control, if desired, by the use of rotor rheostat. Curve No. 1 corresponds to short-circuited rotor, and increasing values of rotor resistance are represented by No. 2, 3 and 4 curves respectively.

A typical example of braking by plugging is illustrated in Fig. 4, which shows a hydro-extractor driven by a direct-coupled induction motor. The basic control scheme of this application is shown in Fig. 3, which illustrates only the arrangements made for plugging. Other

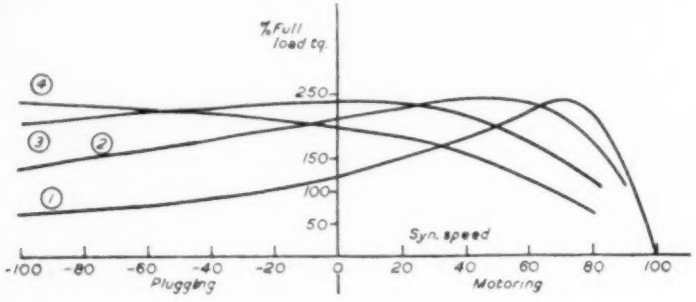


Fig. 2. Speed torque curves for slip-ring motors using plugging control, with varying values of rotor resistance

details of the control, e.g. interlocks, safety features, motorised timer, pilot lamps, etc., are omitted. The diagram shows the "run" switch closed, and the "run" contactor excited. A pair of contacts on the "run" contactor maintains the plugging-switch solenoid excited, thus holding its friction-arm clear of the friction wheel. The latter is mechanically coupled (usually by a flexible drive) to the motor. Opening the "run" switch causes the "run" contactor to open and de-energises the plugging-switch solenoid, thus dropping the friction arm on to its wheel which closes the plugging-switch contacts. This energises the "plug" contactor, which applies reverse-current to the motor during the entire deceleration period. A small angular movement of the motor in the reverse direction after passing through zero speed causes the plugging switch contacts to open, thus de-energising the "plug" contactor and stopping the motor.

The reverse-current method of braking has several features in its favour, among which are:

(*a*) Apart from the plugging relay, no special equipment is required.

(*b*) Braking imposes a balanced load on the a.c. mains in the case of polyphase supply.

Against these must be set the relatively high energy loss dissipated in the rotor circuit during braking.

The magnitude of this rotor loss may be examined generally in the following simple manner:

At any speed n, let W_r = rotor power loss,
let W_e = electrical power input to rotor.

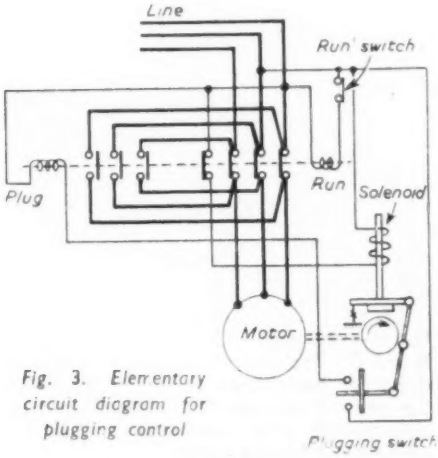


Fig. 3. Elementary circuit diagram for plugging control

Fig. 4. Hydro-extractor with plugging control

let E_R = total energy dissipated in rotor circuit during deceleration.
and E_e = total electrical energy input to rotor during deceleration.

Throughout the braking range where $n = -n_s \rightarrow 0$,

$$\frac{E_R}{E_e} = \frac{\text{Average } W_r(-n_s \rightarrow 0)}{\text{Average } W_e(-n_s \rightarrow 0)}$$

$$= \text{Average } \frac{W_r}{W_e}(-n_s \rightarrow 0)$$

At any speed n, $\frac{W_r}{W_e} = \frac{n_s - n}{n_s}$

Therefore $$\frac{E_R}{E_e} = \frac{1}{n_s}\int_{-n_s}^{o} \frac{n_s - n}{n_s} dn = 1.5 \ldots\ldots (1)$$

(Equation (1) is independent of total braking time or speed/torque characteristic).

In the case of squirrel-cage motor drives where the inertia of the rotating system is high, and the starts are frequent, the ratio defined in (1) is of considerable importance, as shown below:—

Let WR^2 = inertia of rotating system (lb ft^2).
Let T = motor torque at any time t(lb ft).
Let t_1 = total braking time in seconds ($n = -n_s \rightarrow 0$).

From the mass-acceleration relation:

$$\frac{dn}{dt} = \frac{305T}{WR^2} \quad \ldots\ldots(2)$$

$$n_s = \frac{305}{WR^2}\int_0^{t_1} T\,dt = 0 \quad \ldots\ldots(3)$$

Since W_e is proportional to the synchronous speed n_s and the motor torque T,

$$W_e = \frac{2\pi n_s T}{60} \text{ ft lb per second} \quad \ldots\ldots(4)$$

$$E_e = \int_0^{t_1} W_e dt = \int_0^{t_1} \frac{2\pi n_s}{60} T\,dt \text{ ft lbs} \quad \ldots(5)$$

From (3) and (5):

$$E_e = \cdot 00034 WR^2 n_s^2 \text{ ft lbs} \quad \ldots\ldots(6)$$

From (1) and (6)

$$E_R = 1{\cdot}5E_e = \cdot 00051 WR^2 n_s^2 \text{ ft lbs} \quad \ldots\ldots(7)$$

The kinetic energy stored in the rotating system at synchronous speed is $\cdot 00017\ WR^2 n_s^2$, therefore the total loss dissipated in the rotor circuit (neglecting small effects such as motor iron loss, friction and windage) during braking from synchronous speed to zero is *three* times the kinetic energy at maximum speed. However, provided that adequate provision can be made to dissipate the relatively high rotor loss, this type of braking can frequently be employed with advantage on high inertia drives.

D.C. Injection Braking (see appendix)

This method requires the formation of a stationary field system by the application of d.c. excitation to one member (usually the stator). Braking torque is then developed by the resulting currents produced in the rotor circuits. This type of braking is commonly used on a wide range of applications, such as machine tools, mine winders and hydro-extractors. When necessary, a considerable measure of control can be obtained by the variation of the d.c. excitation and, in the case of slip-ring motors, rotor rheostat. The d.c. supply for braking may be obtained conveniently from either a rectifier or a separate generator.

D.c. injection braking has a number of advantages to offer, e.g.:—

(*a*) Braking to zero speed with no tendency to reverse rotation.

(*b*) Relatively low energy loss dissipated in the rotor circuit during braking.

The chief disadvantages are the cost and complication of the d.c. excitation equipment.

In the case of a hydro drive, where the load inertia is high and starts are frequent, item (*b*) above may be of outstanding importance. The

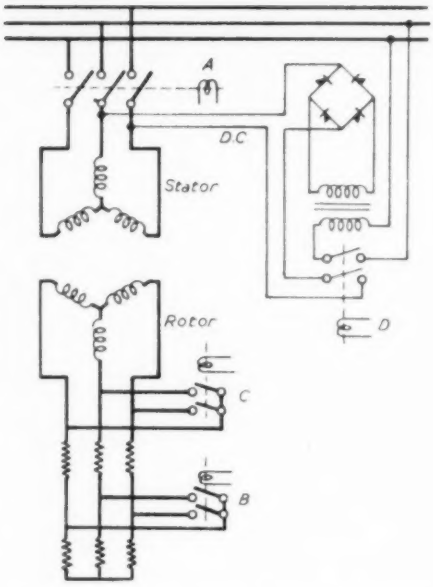


Fig. 5. Elementary circuit diagram for braking by d.c. injection

value of E_R in the case of d.c. excitation is equal to the kinetic energy at maximum speed, i.e., $E_R = \cdot 00017\ WR^2 n_s^2$. Reference to equation (7) indicates that the rotor deceleration loss in the case of d.c. injection is therefore only *one-third* of the value of that produced by plugging on inertia load—this proportion being entirely independent of braking time and speed torque characteristics.

Fig. 6 shows a typical example of d.c. injection braking applied to a machine-tool drive—in this case a horizontal borer. It is necessary to stop the boring tool quickly and automatically at each operation of the "stop" button. The simplified diagram Fig. 5 shows the basic arrangement. Stator contactor A and rotor contactors B and C, together with the usual timing sequence devices and interlocks, are arranged to operate in the normal manner. The braking contactor D, which simultaneously switches on the rectifier transformer and the d.c. supply to the stator, is closed for a controlled period after each operation of the "stop" button—which operation also opens contactors B and C. The total rotor rheostat is thus in circuit for the whole of the braking period. At the end of the controlled braking period, contactor D opens automatically, and disconnects the braking supply.

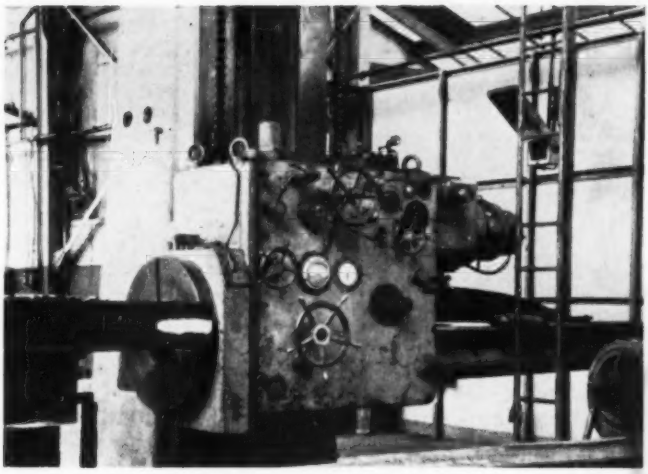


Fig. 6. A horizontal borer—a typical example of the application of d.c. injection braking to a large machine tool

APPENDIX

The braking performance of polyphase induction motors by d.c. injection may be calculated simply in terms of the primary d.c. excitation ampere-turns, and the secondary impedances. Both squirrel-cage and wound rotor motors may be included, the effect of rotor leakage reactance being taken into account. Torque expressions follow logically from the vector solution of a simple equivalent network—all variables being derived by normal design methods.

The a.c. performance of polyphase induction motors, in terms of the fractional slip S, may be represented by the well-known equivalent network Fig. 7, where:

E_1 = Primary supply volts.
E_2 = Secondary volts.
R_1 = Primary resistance.
$\frac{R_2}{S}$ = Equivalent secondary resistance.
jX_1 = Constant primary leakage reactance at *line* frequency.
jX_2 = Constant secondary leakage reactance at *line* frequency.
jX_m = Constant magnetising leakage reactance at *line* frequency.

All quantities are "per phase."

If the primary be d.c. excited by sinusoidally distributed ampere-turns, the general relation between primary, secondary and magnetising ampere-turns per pole may be represented by Fig 8, where:

AT_p = Maximum value of primary sinusoidal ampere-turns per pole.
AT_s = Maximum value of secondary sinusoidal ampere-turns per pole.
AT_m = Maximum value of magnetising sinusoidal ampere-turns per pole.
Φ_m = Maximum air-gap flux per pole in phase with AT_m.
E_2 = Secondary volts induced by Φ_m.

Neglecting iron loss, Fig. 8 represents the rotating-field armature-reaction relation where the primary ampere-turns per pole AT_p must always be equal to the vectorial sum of AT_m and a component equal and opposite to AT_s. By an appropriate change of scale, the *ampere-turn* diagram, Fig. 8, may be transformed into the equivalent *current* diagram, which, in turn,

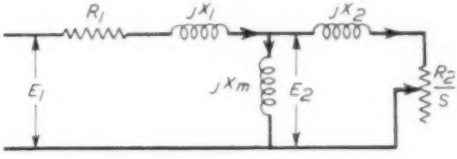


Fig. 7 (on left). Equivalent network for an induction motor

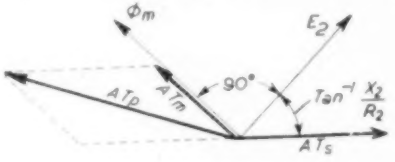


Fig. 8 (above). Ampere-turn diagram for induction motor

leads to the equivalent circuit network, Fig. 9, in terms of the secondary.

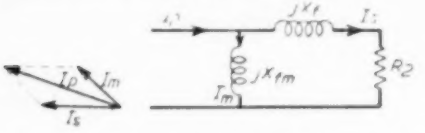


Fig. 9. Equivalent network in terms of the secondary

In Fig. 9, I_p, I_s and I_m are the virtual *secondary* currents per phase which would produce AT_p, AT_s and AT_m respectively, and:

R_2 = Secondary resistance.

jX_f = Secondary leakage reactance at secondary frequency f.

jX_{fm} = Secondary magnetising reactance at secondary frequency f.

Certain fundamental differences between Fig. 7 and Fig. 9 may be observed, e.g.:

(*a*) Primary leakage reactance and resistance terms are exluded from Fig. 9, since the excitation of the primary is d.c.

(*b*) The secondary resistance term R_2 is now constant.

(*c*) The secondary leakage and magnetising reactance terms jX_f and jX_{fm} in Fig. 9 now depend upon the rotor frequency f.

Note.— In general, the primary d.c. excitation may be of *any* field form (possibly supplied by a separate primary winding). Non-sinusoidal primary excitation may be resolved into fundamental and harmonic components by Fourier analysis and appropriate I_{p1}, I_{p3} . . . . I_{pn} calculated. A separate torque solution at a given speed may be obtained corresponding to the number of poles produced by any individual I_{pn}. Since each harmonic component d.c. field produces a different rotor frequency, the resulting torques, at a given speed, may be summed to obtain the total value. In practice it is seldom necessary to consider any component other than the fundamental.

Referring to Fig. 9 (arrows indicate positive direction and dotted terms vector quantities):

$$\dot{I}_p = \frac{\dot{I}_s(R_2 + jX_f)}{jX_{fm}} + \dot{I}_s \quad \ldots\ldots(1)$$

$$\dot{I}_s = \dot{I}_p\left[\frac{X_{fm}(X_f + X_{fm})}{R_2^2 + (X_f + X_{fm})^2} + j\frac{X_{fm}R_2}{R_2^2 + (X_f + X_{fm})^2}\right] \quad (2)$$

From (2) rotor loss per phase =

$$I_p^2 \frac{X_{fm}^2 R_2}{R_2^2 + (X_f + X_{fm})^2} \quad \ldots\ldots(3)$$

In eq. (3) I_p = numerical or scalar value of $\dot{I}_p$.

Squirrel-Cage Rotor

In this case it is convenient to derive eq. (3) in terms of the rotor current per bar which requires the definition of I_m, and I_s in terms of rotor current per bar also where:

N = Rotor bars per pole.

R_2 = Resistance of each rotor bar (including allowance for end connections).

n = Rotor speed r.p.m.

X_f = Rotor leakage reactance per bar at rotor frequency f.

X_{fm} = Rotor magnetising reactance per bar at rotor frequency f.

$$K = \frac{\Phi_m}{AT_m}$$

P = No. of poles.

X_{fm} may be derived in the following manner:

Let I_m = the virtual rotor magnetising current per bar required to produce AT_m, and e the virtual voltage per rotor bar produced by Φ_m rotating at a speed corresponding to rotor frequency f, then

$$X_{fm} = \frac{e}{I_m}$$

$$e = \frac{4{\cdot}44 \times f \times \Phi_m \times 10^{-8}}{2} \quad \ldots\ldots(4)$$

$$I_m = \frac{AT_m \times 2{\cdot}22}{N} \text{ (very closely)} \quad \ldots\ldots(5)$$

From Eq. (4) and (5), and substituting

$$K = \frac{\Phi_m}{AT_m}$$

$$X_{fm} = f \times N \times K \times 10^{-8} \quad \ldots\ldots(6)$$

$$I_p = \frac{AT_p \times 2{\cdot}22}{N} \quad \ldots\ldots(7)$$

The braking torque is derived from the total rotor loss (neglecting iron loss, friction and windage) and the speed.

Total rotor loss watts =

$$I_p^2 \frac{X_{fm}^2 \times R_2 \times P \times N}{R_2^2 + (X_f + X_{fm})^2} \quad \ldots\ldots(8)$$

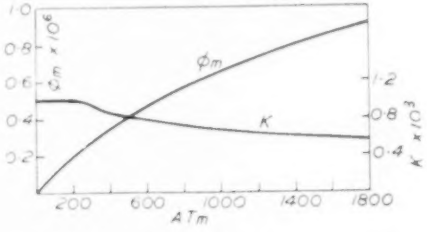


Fig. 10. Saturation curve for a squirrel-cage motor

Magnetic Saturation

It is frequently necessary to calculate the braking torque when the main magnetic path is saturated. In these circumstances an initial value of K, say K_1, may be assumed from the motor "saturation" curve. Using this value K_1 in eq. (6), and the resulting X_{tm} in eq. (2), a value of $\dot{I}_s$ may be found together with the corresponding $\dot{I}_m$ (since $\dot{I}_m = \dot{I}_p - \dot{I}_s$). The numerical scalar value of $\dot{I}_m = I_m$ may now be used in eq. (5) to obtain a value of AT_m which may now be applied to the "saturation" curve to obtain a new value of K, say K_2. The value K_2 should be equal to K_1 originally assumed, otherwise the original K_1 must be adjusted and K_2 re-calculated until equality is obtained. In practice two such calculations are usually sufficient.

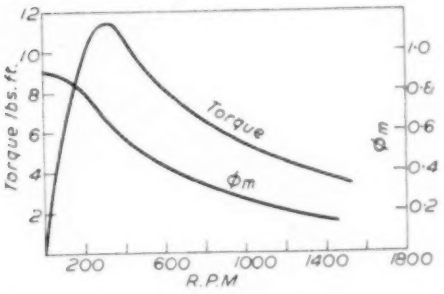


Fig. 11. Values of braking torque (squirrel cage)

Example. Squirrel-cage rotor. Motor "saturation" curve as Fig. 10. N = 24. n = 750. f = 12·5. P = 2. X_1 = ·000025 ohms. R_2 = ·00058 ohms. AT_p = 1800.

From eq. (7) $I_p = \dfrac{1800 \times 2 \cdot 22}{24} = 166$ amp.

Assume $K_1 = 0 \cdot 95 \times 10^3$.

From eq. (6) $X_{tm} = 12 \cdot 5 \times 24 \times 0 \cdot 95 \times 10^{-5}$
$= \cdot 00285$ ohms.

From eq. (2) $\dot{I}_s = 166(0 \cdot 96 + j0 \cdot 192)$
$\dot{I}_m = 166(0 \cdot 04 - j0 \cdot 192)$
I_m(scalar) = 32·5 amp.

From eq. (5) $AT_m = \dfrac{32 \cdot 5 \times 24}{2 \cdot 22} = 350$.

From Fig. 10, the value of K corresponding to $AT_m = 350$ is $0 \cdot 95 \times 10^3$, which agrees with the value of K originally assumed. Had this not been the case, it would have been necessary to adjust the original assumed value of K_1 and re-calculate as explained above.

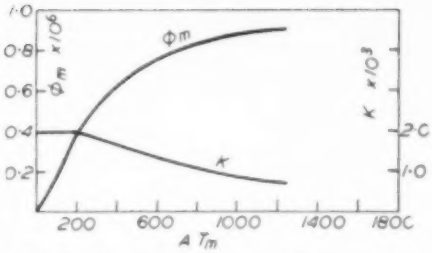


Fig. 12. Saturation curve for a slip-ring motor

From eq. (8), total rotor loss watts

$$= 166^2 \frac{0 \cdot 00285^2 \times 0 \cdot 00058 \times 2 \times 24}{0 \cdot 00058^2 + (0 \cdot 000025 + 0 \cdot 00285)^2}$$

= 730 watts.

Braking torque $= \dfrac{730 \times 7 \cdot 05}{750} = 6 \cdot 85$ lb ft.

Values of braking torque and Φ_m calculated in a similar manner at other speeds are shown in Fig. 11.

Wound Rotor

For simplicity the secondary winding is assumed to be three-phase, 60 electrical degrees "spread" and full pitch. (In cases where the secondary winding is distributed otherwise, equations (9), (10), (11) and (12) may be modified suitably in order to define I_p, X_1 and X_{tm} correctly).

T_2 = Secondary effective turns per phase.

R_2 = Secondary resistance per phase including any external portion.

X_1 = Secondary leakage reactance per phase at frequency f.

X_{tm} = Secondary magnetising reactance per phase at frequency f.

X_{tm} may be defined as equal to $\dfrac{e}{I_m}$ where e is the virtual voltage per phase produced by Φ_m rotating at a speed corresponding to rotor frequency f, and I_m is the virtual rotor magnetising current per phase required to produce AT_m.

$$e = 4 \cdot 44 \times f \times \Phi_m \times 10^{-8} \times 0 \cdot 955 \times T_2 \quad \ldots\ldots\ldots (9)$$

$$I_m = \frac{AT_m \times 0 \cdot 39 \times P}{T_2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (10)$$

From eq. (9) and (1) and substituting $K = \dfrac{\Phi_m}{AT_m}$,

$$X_{tm} = \frac{10 \cdot 9 \times f \times T_2^2 \times K \times 10^{-8}}{P} \quad \ldots\ldots\ldots (11)$$

$$I_p = \frac{AT_p \times 0 \cdot 39 \times P}{T_2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (12)$$

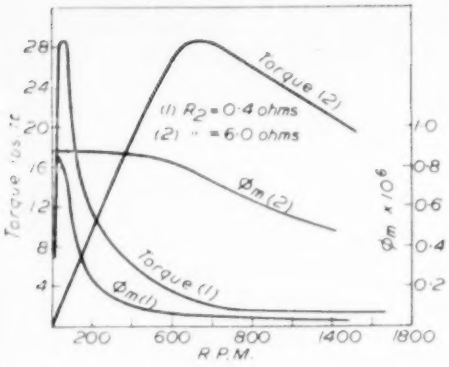


Fig. 13. Values of braking torque (slip-ring)

$$\text{Total rotor loss watts} = I_p^2 \frac{X_{fm}^2 \times R_2 \times 3}{R_2^2 + (X_f + X_{fm})^2} \quad (13)$$

Example. Wound rotor. Motor "saturation" curve as Fig. 12. $T_2 = 96$. $n = 1500$. $h = 50$. $P = 4$. $X_f = 0{\cdot}5$ ohms. $R_2 = 0{\cdot}4$ ohms. $AT_p = 1000$.

From eq. (12) $I_p = \frac{1000 \times 0{\cdot}39 \times 4}{96} = 16{\cdot}2$ amp.

Assume $K_1 = 2{\cdot}0 \times 10^{-5}$.

From eq. (11) $X_{fm} = \frac{10{\cdot}9 \times 50 \times 96^2 \times 2 \times 10^{-5}}{4}$

$= 25{\cdot}3$ ohms.

From eq. (2) $\dot{I}_s = 16{\cdot}2(0{\cdot}98 + j0{\cdot}016)$

$\dot{I}_m = 16{\cdot}2(0{\cdot}02 - j0{\cdot}016)$

I_m (scalar) $= 0{\cdot}405$ amp.

From eq. (10) $AT_m = \frac{0{\cdot}405 \times 96}{0{\cdot}39 \times 4} = 25.$

From Fig. 12, $K_2 = 2{\cdot}0 \times 10^{-5}$, which agrees with K_1.

From eq. (13), total secondary watts loss

$$= 16{\cdot}2^2 \frac{25{\cdot}3^2 \times 0{\cdot}4 \times 3}{0{\cdot}4^2 + (0{\cdot}5 + 25{\cdot}3)^2} = 304 \text{ watts.}$$

$$\text{Braking torque} = \frac{304 \times 7{\cdot}05}{1500} = 1{\cdot}43 \text{ lb ft.}$$

Fig. 13 shows braking torque and Φ_m calculated in a similar manner at other speeds, $R_2 = 0{\cdot}4$ ohms (curve 1) and $R_2 = 6{\cdot}0$ ohms (curve 2). Curves for other values of R_2 corresponding to various values of external rotor resistance may be derived similarly.

The author is indebted to Manlove Alliott and Co. Ltd. and Ransomes and Rapier Ltd. for the use of Fig. 4 and Fig. 6 respectively, and to Bull Motors (Branch of E. R. and F. Turner Ltd.) for permission to publish this article.

BRITISH STANDARDS

Report on the Selection of Ranges of Types and Sizes. *B.S. 1638: 1950. Price 3s.*—Experience shows that consumers' requirements are frequently satisfied with a range of sizes or capacities constituting a geometric series in which each size or capacity is a uniform percentage larger than its predecessor. The word "capacity" is used in its widest sense and covers all manner of characteristics, such as area, volume, weight, power, rating, and so on.

Woven Cotton Tapes. *B.S. 1624 to 1626: 1950. Price 2s. 6d.*—These British Standards have been prepared in collaboration with the Services, Government departments, national organisations, and other large users, and provide quality standards for a wide variety of purposes. They cover manufacture and finish, and give constructional details for a number of widths for fine, medium and heavy quality tapes. The loomstate particulars include minimum number of ends in width and picks per inch, weight per gross yards, and minimum breaking load values; guidance is given on counts of yarn. Tolerances are specified for width and weight. Appendices provide methods for conditioning test specimens, and for the determination of width, length, weight, picks per inch, number of ends in width and breaking load values.

Tensile Testing of Materials. *B.S. 18: 1950. Price 2s. 6d.*—This is the fourth revision of the standard which was first published in 1904. With the exception of the definition of proof stress, the standard has not been fundamentally altered. The definition of proof stress now adopted is, however, quite different from that contained in previous issues, as it has been amended to bring it in line with the practice, current in industry, of obtaining proof stress under load. The definition is amplified to indicate methods which may be used to ascertain if the material is satisfactory when the actual value of the proof stress is not required.

Section 1 of the revised Standard contains the definitions of the principal terms relating to the tensile strength of materials. Section 2 sets out in detail the forms of standard tensile test pieces for sheets, strips, sections, machined and unmachined rods and bars and so on. It also includes the special test pieces for cast iron, malleable cast iron, steel tubes, cylinders and wire. Section 3 deals with the standard methods of procedure for tensile testing, and includes guidance on the preparation of the test piece for testing.

British Standards can be obtained post free, for prices given above, from the B.S.I., 24 Victoria Street, London S.W.1.

Problems and Practice

IN ENGINEERING

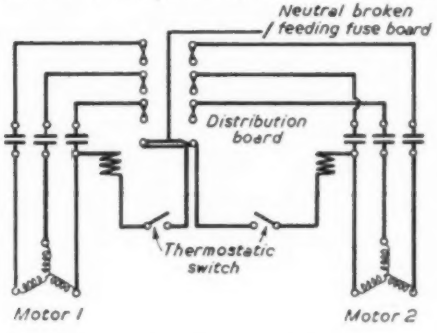
No Neutral

AN electrician returned from a fault to report that he could find nothing to cause the trouble.

The fault was on two 3-phase motors, fully automatic control being used, namely a thermostatic switch. One motor would not run without the other and vice versa. Both motors were in fairly constant use and the fault may have been of long standing.

A test at the distribution board with a "Megger" showed a good all-round insulation. A test lamp also showed all phases to be alive. On testing the phases to neutral it was found that if one motor was switched off, one phase would not light to neutral and with it on and the other off a different phase behaved likewise.

What had happened was this: when the plant was installed someone had run in three phases and picked a neutral up from the nearest lighting board. This board had become obsolete with part of the building, but the neutral to this plant had not been renewed.



Connections of automatically controlled motors

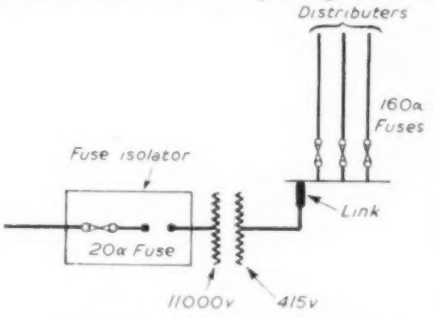
When both automatic controls were on the motors ran, as the coils were fed from different phases and the two coils were in series across two phases, but if one of the automatic switches broke the circuit both motors stopped.

Likewise the test lamp had registered in series with the coil as each motor had been switched on.

A fresh neutral was run and all was well once again. The accompanying sketch shows how this occurred.—*C. F. Mould.*

Large Fuse Ratio Needed

A 250 kVA 11,000/415 V transformer supplying a housing estate was controlled on the e.h.t. side by an oil-immersed fuse isolator fitted with fuses of 20 amp rating. The low



Fuse and transformer relative positions

tension side was connected to a distribution pillar feeding several distributors, each of which was controlled by 160 amp h.r.c. fuses.

A fault developed on one of the distributors, with the result that the 20 amp h.t. fuse blew, thus isolating the sound distributors as well as the faulty one.

On the face of it, the rating of the h.t. fuse referred to the secondary side would have been in the region of 500 amp, which would be quite adequate from the overload standpoint. The cause of this incorrect operation was that the fuses had different time/current characteristics, and with the high short circuit current involved the h.t. fuse had a quicker blowing time than the l.t. fuse.

This example shows how care should be taken when arranging fuses of different types in series to consider the current rating in conjunction with the associated time/current curves if satisfactory operation is to be obtained.—*J. R. K.*

Single-Phase Supply

I RECENTLY installed a 3 pin socket outlet into which an electric washer was to be plugged. Having duly connected the middle socket terminal to the cold water pipe some few feet away, I thought I would check, to some extent at least, the soundness of the earth connection. By connecting the earth socket via a test-lamp to the other sockets in turn, with

the supply switch on, I anticipated that I should get full brilliance of the test-lamp with one connection and no light whatever with the other. To my surprise, the lamp lit to a dull brilliance when connected in both the ways mentioned. As the insulation resistance between the outer sockets and the centre one was high, I was unable to explain to myself the conditions revealed.

Some time later, I was planning an extension to the above installation, and with this in mind and in order to bring the existing installation as up-to-date as possible by fitting a new distribution board, I called at the local office of the B.E.A. to enquire as to their wishes with regard to the fusing of the sub-circuits, i.e. as to whether fuses should be fitted in both conductors of each sub-circuit, or in one only. I was informed that as the supply, to the area in which the house in question is situated, was taken from the 220 V secondary of a double-wound transformer, the middle point of which is earthed, fuses would be required in both conductors of each circuit.

This information not only gave me the guidance I required but explained for me the conditions described in my first paragraph when testing the plug circuit and its earth connection.

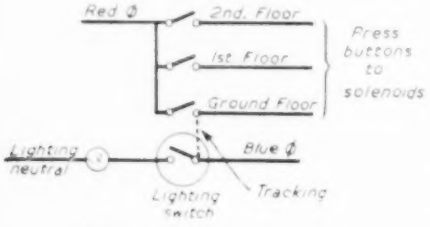
The rigid application of the Regulations for the Electrical Equipment of Buildings will not obviate the condition that, in whichever conductor single-pole switches are inserted, all parts of the installation will at all times be 110 V above earth potential. This installation is, by the way, in a thickly populated area of a large industrial town.—*A. B.*

Lift Fuse Blows

THE writer was called to investigate and rectify trouble with a press-button operated (all a.c.) lift. The complaint was that the control panel fuse was frequently blowing when the ground floor button was pressed in the lift cage. The operating solenoid, its immediate wiring and connections, were tested for earthing, including, of course, the cable leading from the cage press buttons: all proved to be sound. A further test was made with the offending button pressed and an earth reading was shown on the press button. The same test was carried out with the cage lighting switch in the off position and the test this time from line to earth was more or less infinity. A final test was made between phases and a very low reading obtained between red and blue phases when the ground-floor button was pressed. On investigation of the button panel, it was discovered that tracking was taking place between the press-button switch wire and the lighting switch feed which was mounted on the same panel immediately beneath.

The sketch will show that when the button was pressed, 400 V p.d. was between these points. I point out that the whole of the lift circuit, including lights, are on control from a triple-pole and neutral switch fuse, the control panel wire between one phase and neutral and the lighting off another, with motor off 3-phase.

The test which gave earth reading with the button pressed and light switch on was due, of course, to tracking via lighting circuit to neutral.—*A. V. Worrell.*



Lift control button connections

The Care of Portable Drillers

PORTABLE machines are much used in repair work, and are, fortunately, free from serious faults. However, slight earths are not uncommon, this is on account of the small clearance in the machine and the fine metal dust which is produced by the machine. Usually, a good clean and blow-out will clear the fault. Damp may also be responsible. These machines are frequently used under bad conditions, but when out of use at the end of each day's work, should be kept in a warm, dry place. A trouble which may be experienced is a magnetised drill and chuck. The usual cause is electrical leakage which permits the drill to have a small voltage, and the actual drilling of ferrous metal does the rest. In practice, breakage of drilling leads is unavoidable. The joints made should be soldered at the two extremities, sufficient to prevent the joint unravelling, but at the same time give flexibility. After insulation, the joint should be painted with waterproof varnish.—*W. E. W.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

Notes on Wiring
by MEGOHM

Belgian Standards for Wiring

C.E.T. Minimum Requirements

READERS may recollect that I gave some details a month or two ago of the American recommendations for adequate wiring in private dwellings of the average type. This has brought me a letter and an interesting booklet from the General Director of a Belgian Committee or Association formed with the same general objects in view.

Known as the C.E.T., the Committee of Technical Studies for the production and distribution of electricity in Belgium is a non-profit making organisation, and has recently launched a general campaign to promote better wiring, both from the safety point of view, and for the general convenience of the user. The booklet displays on the front the standard of quality mark "Confort Electrique," which is also embodied in their official certificate certifying that an installation conforms to their minimum requirements.

Recommended Standards

Unfortunately, for me, the booklet is printed in French, but relying, as many others do without acknowledgement, upon the skill and veracity of a trusty secretary, it would appear that the information contained therein is a happy blend of technical and non-technical matter, so arranged that the layman can discern the short-comings of his existing installation, and thus it may foster a desire to have these rectified, which is all to the good.

To qualify for the certificate, the following must be observed. In a building of not more than two inhabited floors at least, three separate circuits must be run from the main board, these circuits to feed the kitchen, storage-type heaters, and other points respectively. This method of wiring is partly intended to assist consumers where tariffs of the all-in type may not be available. For larger installations, sub-boards are specified, the minimum size of conductor feeding these being 2·5 sq. mm, which is just under 15 s.w.g. and rather more than 1/·064 in., if the voltage is 150 or above. For voltages below 150, the minimum cable size is 4 sq mm, almost 13 s.w.g. or 1/·092 in.

Where lighting points are divided over several sub-circuits these should be so arranged that adjacent rooms are not fed from the same fuse, i.e. the division of circuits should be on a vertical line through the house, rather than horizontal.

Switches and Sockets

Much attention is given to details of switching, and the switch positions. Every room should have at least one switch inside the room by the door, and if double doors are used care should be taken to place the switch by the half of the door which is used the least. Full two-way or two-way and intermediate switching for staircase lights is deemed essential, as in fact it should be, so that the points on the landings above and below can be controlled from the intermediate landing.

I also notice that automatic switches, with adjustable time-lags are suggested as an alternative. These are very common abroad and must save a considerable amount of current and cause no inconvenience as everyone is familiar with their use. Over here we seem to prefer to make the landlord pay for continuous evening staircase lighting.

Sockets of 10 amp capacity seem to be the standard size for general lighting and small power purposes, and the allowance for these is rather more liberal than that usually deemed sufficient over here. For living-rooms three are the minimum, bedrooms, dining-room and kitchen two for each, and one socket for any other inhabited room plus one for each landing. These socket outlets are all additional to any switch controlled sockets installed in a room in lieu of a ceiling point.

Suggested Lay-out

A neat plan of a two-storey house is given, complete with all points and switches and a full wiring diagram. Unlike our practice, some of the sockets have an earth connection and others have not. A socket is also indicated for the bathroom, and a water-heater immediately above the bath. The installation is shown as being fed on the 3 phase 4 wire principle, all lighting and sockets being balanced across the three phases, with separate 3 phase circuits to two water-heaters and a cooker.

Transformer Troubles—and Remedies

by S. SPENCE, B.Sc.

No. 2 of a series of trouble-shooting tables specially compiled to assist maintenance engineers in rapid fault diagnosis

TRANSFORMERS are, of course, less conspicuous in operation than other types of electrical power plant, due primarily to their static nature. Being even more inherently reliable than rotating machines, there is a tendency, particularly in the smaller sizes, to overlook them and omit them from the periodical maintenance inspection routine. They often become forgotten altogether until some trouble develops, manifesting itself usually in the form of overheating which passes unnoticed or is neglected until actual breakdown occurs.

Like all other electrical apparatus, transformers require regular inspection and maintenance so that any unusual symptoms can be detected in good time, investigated and given the requisite immediate attention to prevent more serious consequences. The following table lists some of the more common troubles that might be experienced, and gives suggested remedies for the probable causes.

SYMPTOM	CAUSE	REMEDY
General overheating.	Overloading.	Reduce the load; or increase the power factor of the system if unduly low; or instal an additional transformer to share the load.
	Improper division of load in a bank of transformers operating in parallel.	Rectify by ensuring that all the transformers in parallel have:— (a) The same turns ratio. (b) The same percentage impedance. (c) The same ratio of resistance to reactance pressure drop.
	Unbalanced single phase loading, resulting in overloading of one phase of a polyphase transformer.	Re-distribute the load between the phases to obtain reasonable uniformity of the phase loadings.
	High ambient temperature due to inadequate ventilation of the transformer house.	Improve the ventilation either by:— (a) Modifying the building structure to obtain increased air space and circulation. (b) Installing a system of forced ventilation.
	Heat radiation from an adjacent source.	Move transformer to a more suitable location or erect a protective barrier between the transformer and the source of heat.
	Restriction of the internal cooling system of the transformer due to:— (a) The oil level having fallen below the top of the cooling tubes, thereby preventing proper circulation of the oil. (b) Sludge in the cooling ducts or on the windings.	(a) Top up with new oil to the correct level. Check tank for leaks and repair as may be necessary. (b) Remove the core and oil from the tank, thoroughly clean the ducts and windings by spraying with oil under pressure. If the sludge is hard and adhering strongly to the windings and ducts, expert attention is advisable as complete dismantling will probably be necessary. See note 1 regarding sludge.
	Ageing of core plates due to deterioration of the material of the laminations, with resultant increased iron loss.	Rebuild core, which will usually involve also the complete re-winding of the transformer.
General overheating without load on a star/star connected shell type transformer.	Secondary neutral only earthed, thereby resulting in a pronounced third harmonic component of the magnetic flux and a substantially increased iron loss.	Some form of harmonic suppression such as a delta connected tertiary winding is required. Alternatively the neutral point of the secondary should be insulated from earth.

SYMPTOM	CAUSE	REMEDY
General overheating accompanied by indications of actual breakdown (confirmed by a voltage ratio test, with a suitably reduced applied voltage).	Short circuits between turns of the windings due to sharp edges on the copper conductors piercing the insulation as a result of vibration on load or consequent upon the windings being subjected to repeated electro-magnetic shocks through external short-circuiting or switching in on heavy loads.	Repair defective portion of winding.
	Dislodgment of one or more turns of a coil caused by a heavy external short circuit, followed by abrasion of the insulation between adjacent dislodged turns by vibration.	Repair defective portion of winding and secure all dislodged turns in correct positions.
	Moisture, which may have gained access to the interior of the transformer either through badly fitted gaskets, inadequately maintained breathers or when opened up for overhaul.	Repair defective portion of winding and if necessary dry out the remainder of the winding. At the same time the oil should be checked for the presence of moisture (see Note 2). At the same time, gaskets should be overhauled and breathers checked for effectiveness of drying agent (see Note 3).
	Corona. In very high pressure transformers, deterioration and consequent breakdown of the conductor insulation may result from corona which may take place from sharp or slightly rounded edges. This phenomenon becomes more acute should there be any occluded air in the coils.	Repair the defective portion of the winding, taking suitable precautions to prevent occlusion of air in the coils.
	Rapidly fluctuating loads with consequent expansion and contraction of the copper conductor and alternate compressing and releasing of pressure on the insulation.	Repair the defective portion of the winding. (The possibility of a recurrence cannot be entirely eliminated if the load is necessarily rapidly fluctuating in character.)
	Line surges.	Surge diverters may be necessary.
Low insulation resistance between primary and secondary windings or between winding and core.	Breakdown of insulation due to:— (*a*) Line surges. (*b*) Shifting of coils due to switching on and off at heavy loads. (*c*) End turn insulation not adequately reinforced. (*d*) Lightning discharge. (*e*) General overheating. (*f*) Moisture.	Repair damaged parts and (*a*) Fit suitable reactor. (*b*) Adequately secure all coils in correct positions. (*c*) Suitably reinforce all end turns. (*d*) Fit lightning arrestor. (*e*) *and* (*f*) See previously described remedies.
Unequal heating in a bank of star connected transformers with neutral earthed.	Earth fault on one phase due to failure of insulation either externally or internally.	Disconnect the bank, locate and repair the earth fault.
Unequal heating in a bank of transformers connected star/delta.	Earth fault on one of the primary phases due to failure of insulation either externally or internally.	Disconnect the bank, locate and repair the earth fault.
Localised overheating in transformer.	Eddy currents in the core, etc., due to:— (*a*) Breakdown of the bolt insulation. (*b*) Breakdown of the insulation between the laminations. (*c*) Breakdown of the insulation between the yoke and the yoke clamping plates. (*d*) Edges of the core and yoke laminations being burred over into contact.	(*a*) (*b*) *and* (*c*) Renew the defective insulation and as the original source of the breakdown may be vibration, ensure that the core clamping bolts and structure tie-bolts are adequately secured. (*d*) Suitably adjust or renew the defective laminations.
Unequal phase voltages in a three-phase bank of transformers.	Earth fault on one phase (either externally or internally) of a star/delta connected bank.	Disconnect the faulty bank and locate and repair the earth fault.
	One transformer connected so that its polarity is opposite to that of the others.	Correct the polarity connection.
Output voltage incorrect (too high or too low).	Leads connected to the wrong ratio taps.	Reconnect the leads to the most suitable taps.

(For notes on this table see the following page)

Notes Concerning Maintenance Table

Note 1. **Sludging.**—Sludging, which is usually indicated by the oil being more or less thick and darkened in colour, is associated with acidity and a sample of the oil should therefore be tested to obtain the acidity value in accordance with the method described in B.S. 148-1933. When the value exceeds 2.5 mg. KOH per gm of oil the whole of the oil should be removed from the tank, and after the core and windings have been thoroughly washed down with new oil (which should then be discarded) the tank should be refilled with new oil. At the same time, the underside of the lid and the walls of the tank above the oil level should be examined for possible corrosion. Where necessary they should be cleaned and painted with an acid resisting paint. When a change of oil has been effected because of high acidity, it is advisable to check the acidity value of the new oil over a period of 12 to 18 months to ensure that all traces of the original acid have been removed.

It might be mentioned here that when opening up an oil-cooled transformer for examination, naked lights of any sort should be avoided as there is always a possibility that an accumulation of inflammable gas may be present.

Note 2. **"Crackle" test for oil.**—This consists of heating a sample of the oil over a flame or plunging a red-hot iron into it, when the presence of moisture is indicated by a characteristic crackling noise. The whole of the oil should be passed through a centrifugal cleaner or filter to remove all traces of moisture and if necessary this treatment should be repeated until satisfactory test results are obtained.

A more accurate test for oil deterioration is the "Electric Strength Test" laid down in B.S. 148-1933. Under this test the sample of oil should not break down at less than 30 kV. If it does so it should be filtered and re-filtered until it withstands the test.

Note 3. **Drying of breathers.**—In the Silica Gel type, the gel contains a dye which changes from a blue colour to pink when moistened and the gel should be changed as soon as the blue tint has disappeared from the inspection window. The wet charge can be reactivated by heating at 150°C-200°C for a few hours until the characteristic blue colour has been restored. In the calcium chloride type this agent is not worth re-drying and the used charges should be discarded.

Jubilee of the Central Line

NEXT Sunday the Central Line (formerly the Central London Railway) celebrates its half-century, having been opened for traffic on July 30, 1900. Contrary to general belief, the "Twopenny Tube," as it was familiarly termed, is not the second oldest Tube line, since the short Waterloo and City Railway antedated it by two years.

Originally constructed between Shepherd's Bush and the Bank, it was extended to Wood Lane for the Franco-British Exhibition of 1908 and to Liverpool Street in 1912. A further extension to Ealing Broadway was opened in 1920. Further extensions opened since 1946 have extended it from West Ruislip to Epping—its original 5 miles of route has grown to 45 miles.

Originally the line was worked with six-car trains hauled by double-ended locomotives, having gearless motors with armatures mounted direct on the axle, giving rise to vibration trouble. Geared motors gave little improvement, and in 1904 B.T.H. multiple-unit control was introduced, with seven-car trains having a motor coach at each end. Power supply was from the company's own power house at Wood Lane until 1928. For many years three-rail operation with track return was in use, but this has now been changed to four-rail operation.

The Central London Railway pioneered a number of experiments, notably in ventilation, in the use of ozonised air and in the use of mechanical regenerative braking, stations being located at higher levels than the general run of the line, thus using gravity to assist acceleration and braking.

An interesting anecdote concerning the pioneer work is told in *BTH Reminiscences*. The railway engineers had omitted to allow in their design for the rail-height and the first locomotive refused to enter the tunnel! New springs and shallower rails got them out of this embarrassing experience.

On left: Original train of 1900 with double-ended locomotive

Below: Present day rolling stock

Distribution of Consumer Goods

Electrical Appliance Sales Survey

SOME interesting figures, dealing with the distribution and selling of electrical appliances are given in a recent book, *The Distribution of Consumer Goods*, by James B. Jefferys, assisted by Margaret Maccoll and G. L. Levett, published by the Cambridge University Press on behalf of the National Institute of Economic and Social Research.

Although the period covered by the analysis is 1938, the operation of price and margin control, and the method of allocating supplies on pre-war datum lines during both war and post-war periods, have made the 1938 figures fairly applicable to present-day conditions.

Distribution

Consumers' expenditure in 1938 on portable electric fires, irons, kettles, toasters and other household appliances was estimated at between £5-6 millions. There were three main methods of distribution, and the proportion of total sales estimated to have passed through them were from manufacturer to supply undertakings 10-15%; from manufacturer to wholesaler or factor, to retailer 25-30%, and from manufacturer to retailer or electrical contractor 55-65%. There were approximately 600-800 wholesalers who traded in domestic appliances, but the great bulk of the material was handled by some 300 firms. Retail shops specialising in the sale of electrical goods were between 4,000 and 5,000, although 10,000 other shops carried electrical goods as a side line. Of the total retail sales, specialist shops undertook about 60%; department stores 5-10%; multiple radio and electrical shops 8-12%; and co-operative stores 1-3%. The remainder was sold in such establishments as variety chain stores and ironmongers. Of the electrical goods sold to supply undertakings (about 15% of the total) the greater part was not sold outright to the public, but was hired, or sold on hire-purchase.

Comparatively little price cutting was found, the retail prices being fixed either by the manufacturer or by the wholesaler. The estimated profit margins are estimated as follows:

Wholesalers or factors usually received a discount of 25% off the list price less 10-20%; the average margin earned by wholesalers and factors being 15-17½% on sales. Supply authorities received a basic discount of 25% off the retail price with rebates ranging from 10-15% for bulk orders. Supply authorities operating through the Bulk Purchasing Committee, established in 1938, averaged a margin of 30-35% on sales. Finally, electrical retailers and contractors obtained a margin of 25% whether purchasing through factors or direct from manufacturers, although in the cases of large retailers, department stores, and multiple and chain variety stores purchasing direct from manufacturers there was often an additional rebate of 10-15%.

In addition to these discounts, all purchasers were usually entitled to settlement discounts ranging from 3¼% to 5% for payment in seven days and 2½% for payment in a month.

Total costs of distribution were thus computed at about 44% of retail sales.

Electric Lamps

In the electric lamp field, the total expenditure in 1938 was about £1·5-2 millions. This figure refers solely to the private customer, and represents a sale of between 30-35 million lamps of which roughly 40% were 60-watt and 30% 40-watt. Over fifteen different mains voltages were catered for, although 230 volt lamps represented one-third of the total.

The proportions of total sales of general service electric lamps passing through the main channels of distribution were 27-33% from manufacturer to wholesaler and then to retailer; 55-65% from manufacturer to retailer, and 8-12% from manufacturer to supply authority. The number of retail outlets was much higher than that estimated for electrical appliances being 35,000-40,000, and the percentages of different types of retail outlet are estimated as: electrical retailers and contractors, 41-47%; variety chain stores, 30-33%; electricity supply authorities, 10-15%; other outlets, including ironmongers, department stores and co-operative stores, 10-14%.

The average wholesale margin on both ELMA and non-ELMA lamps was 15% on sales, and the average retailer margin on both types was 33% on sales. Total distribution costs were 44-46%.

The book also gives statistics relating to vacuum cleaners, the sales of which amounted to £5 million, and in which the cost of distribution was 44-47% of retail sales, and radio receivers and radiograms where the distribution costs amounted to 50-52% of the total retail sales.

overseas news

New Swedish Power Station

Sweden is to build a new 670 million kWh generating station at Liggaforsen on the Lule River, North Sweden. The station will lie about 10 kilometres farther down river than the new Harspranget station, now still under construction.

Liggaforsen is scheduled to be in operation by 1955. The cost will be 60 million krona (over £4 million) compared with 108 million (nearly £7½ million) spent on the Harspranget station.

Sweden's power stations at the end of 1949 had a capacity of 3,010 megawatts, it was stated by Mr. Erik Blomqvist in an address to the annual meeting of the Swedish Water-Power Association. More than 1,500 megawatts, or ten times the 1944 figure, is now in course of construction.

Victoria Commission Floats Loan

Strong support was forthcoming for the Victoria State Electricity Commission's £3 million fourth Kiewa-Morwell loan when it opened in Melbourne recently.

On the eve of the loan, Mr. Hunt, chairman of the Commission, announced that the Commission had decided to seek the help of large contractors at home and abroad to speed up work on the brown coal and hydro-electric projects.

The loan will help finance three major projects already under construction. They are Kiewa hydro-electric undertaking, Morwell brown coa briquette plant, and Yallourn power station extensions.

Mr. Hunt said that, as part of its new plan to supplement its own design and construction forces by seeking contractors' help, the Commission was discussing with large European organisations the question of a contract for part of the Kiewa hydro-electric project.

The Commission's representative in Europe was looking for consulting engineers to make surveys, designs, and specifications, and advise on tenders.

"Negotiations with an English engineering firm for the complete erection of the two new briquette factories to be erected at Morwell are in an advanced stage," Mr. Hunt added.

At Yallourn the Commission plans to build another two complete unit power stations, each of 100,000 kilowatts capacity, at a cost of approximately £10,000,000 each.

Corresponding expansion of coal winning operations, installation of a new power transmission line and sundry additional works will cost another £6,000,000. The new section is expected to begin operating in 1953 and to be completed in 1954.

A second extension is planned to be completed by 1956, which is also the scheduled completion date of the Kiewa project.

The two extensions will enable Yallourn, already the source of about 60% of the State's electricity, to double its present output.

The total works programme of the SEC involves a capital expenditure of between £50 and £60 million.

Capital expenditure in 1948-49 exceeded £6,750,000 and a record sum of nearly £16,000,000 was budgeted for in 1949-50.

Australian Preference Move

After December 31 this year admission of duty free electrical fittings to Australia will not be extended without Australian manufacturers being consulted, the Government has decided. In May this year manufacturers complained about the import of domestic electrical appliances; they could, they said, adequately cope with the demand.

The Telegraph (Brisbane) says that the move is regarded solely as an effort to give preference to Australian made electrical fittings. It will also mean that a large proportion of the electrical fittings for the 5,000 pre-fabs Australia is importing will be supplied by Australian firms, since only a few will be delivered by the end of the year

Australia to call for T.V. Tenders

The Australian Post Office is to call new tenders for equipment for the television station to be built in Sydney. The Postmaster-General, Mr. H. L. Anthony, said that the decision had been made after he had held discussions with the Director-General of Posts and Telegraphs and the Australian Broadcasting Control Board.

He said that some technical developments had taken place in television in Britain and the United States since tenders were called two years ago for Australian television equipment. He had asked the Post Office and the Australian Broadcasting Control Board to prepare specifications and call tenders for the Sydney station as early as possible. The Sydney station would give invaluable experience in technical aspects and programmes.

Comox Valley Conversion

Conversion to 60-cycle system in the Comox Valley area of Vancouver Island will cost between $800,000 to $900,000, according to the B.C. Power Commission. A big substation on the Puntledge River will cost $250,000. About half the cost will be borne by consumers, to whom the Commission intends to advance up to 150 dollars each. Repayment will be at not less than 4 dollars a month plus a fee of 6% to cover interest and accounting charges.

Work on the first phase of conversion is already in hand at the site of the Puntledge River trans-

mission substation. Final phases of the household and commercial conversion will probably be undertaken by autumn.

Six distribution substations will also be built, at Courtenay, Cumberland, Comox, Royston, Comox Road and Royston Road, at a cost of $70,000, with an additional $70,000 for distribution lines.

Power Pole Contract

An order worth $80,000 has been placed by the B.C. Electric Company with Dominion Bridge Company, Vancouver, who have developed a simplified method of making tapered steel trolley coach poles. Previously, United States dollars were required to purchase poles from a Canton, Ohio, firm. Now they are to be made for the first time in Canada. The order for 450 poles will require about 20,000 man-hours to complete. Delivery will begin in May.

Austrian Transformer Production Hampered

Linzer Elektrobaugesellschaft (Linz Electrical Construction Company), which last year stepped up its output of transformers to 18 times the pre-war volume, is now finding production handicapped by shortage of transformer sheets. Some workers have been temporarily stood off, although the firm has enough orders on hand to operate at full capacity for a year.

The lack of adequate supplies is due to the fact that the former chief source of supply, a plant at Hamborn, Western Germany, is scheduled for dismantling and therefore is no longer in the export market. Supplies from the United States are hard to obtain even though the Elektrobaugesellschaft is a foreign exchange earner, having started exports of transformers in the course of last year.

Electrical Exhibition at Bologna

The first international exhibition of electrical appliances (Mostra Internazionale di Applicazoni della Elettricita) to be held in Italy opens in the building and grounds of Bologna University on September 16. Coinciding with the first centenary of Augusto Righi, the famous Bolognese scientist, one international and eight national congresses will also be held.

A large number of people interested in electric appliances are expected to visit the exhibition. Closing date for application for space is August 31, and inquiries should be addressed to Mostra Internazionale di Applicazoni della Elettricita, Via Farina 6, Bologna.

Greek Electrification Project

Work is to start next month on a scheme to increase the installed electrical capacity in Greece by 165,000 kwh., by means of one thermal and three hydro-electric plants spread over the mainland from north to south. Greece's present available electric power of 500 million kwh. should be trebled by 1953. Total expenditure is estimated at about 80 million dollars.

Some 630 miles of 150,000-volt transmission lines will be laid and about 25 step-down stations will be built under the project. The four transmission and distribution plants are intended initially to serve the most densely populated areas of Greece. The electric facilities will, however be so constructed that they can eventually be extended to provide an interconnected high tension network serving the whole of the Greek mainland. A thermo-electric plant in the Eubean Gulf area will burn pulverised lignite, produced primarily by the nearby mines at Aliveri and Kymi. The three hydro-electric plants will use Greece's important, but so far unexploited, water power. These projects are the first stage of a five-year electric power system plan, for which contracts, valued at $206 million, have just been signed by the Greek Government and the United States Electric Bond and Share Co.

Sao Paulo Electrification

Thursday last saw the official opening of a part of the Sao Paulo electrification scheme, being that portion of the Estrada de Ferro Santos a Jundiai which lies between Mocca and Jundiai, thereby reaching a culminating point in one of the greatest contributions made by the English Electric Co. Ltd. to the export drive. The contract, which is worth approximately £2,000,000, was the outcome of long negotiation between the engineers of the English Electric Co. and the railway officials. The route length of main line to be electrified is approximately 40 miles of 5 ft 3 in. gauge double track, and includes sections with steep gradients. The contract covers the power supply which is obtained at 88 kV from the hydro-electric station of the Sao Paulo Light and Power Co., and is led into the main substation at Tiete, where it is transformed down to 33 kV. Two other substations, approximately 12½ miles apart, are at Caierias and Campo Limpo. Each substation has an installed capacity of 4,000 kW using pumpless steel bulb rectifiers. The d.c. o.h. line and double circuit 33 kV transmission lines have been supplied and are being erected by the sub-contractors, British Insulated Callenders Cables Ltd.

The fifteen locomotives which are being supplied are the most powerful yet built in the U.K., being of 3,000 h.p., 3,000 V d.c. each, and suitable for mixed traffic. Three 3-coach suburban electric trains are also being supplied to the railway for use on their system. The wheel arrangement is of the Co-Co type, and regenerative braking is incorporated.

The official ceremony was attended by the Brazilian Minister of Transport and Public Works, General Joao Valdetaro de Amorim Lima, and the administrator of the railway, Dr. Renato de Azevedo Feio. The British Ambassador to Brazil was represented by the Consul General at Sao Paulo.

PERSONALITIES

IN THE INDUSTRY

The Engineers' Guild has appointed **Mr. Bryan Donkin,** B.A. (Cantab.), M.I.E.E., as chairman of the Executive Committee, and he has relinquished the post of honorary treasurer, his successor being **Mr. L. S. Atkinson,** M.I.Mech.E., M.I.E.E.

The Earl of Verulam has been appointed to the Board of the District Bank, and to the London Committee.

Ekco-Ensign Electric Ltd. announce the appointment of **Mr. V. Oliver** as representative covering certain Western London Postal districts and the County of Middlesex. He will operate from the London Office at 5 Vigo Street, W.1.

The new president of the Institute of Physics is **Prof. W. E. Curtis,** professor of physics, King's College, University of Durham. **Prof. E. G. Cox** is a new vice-president, and **Dr. F. P. Bowden** and **Mr. G. R. Noakes** have been elected ordinary members of the Board. The honorary treasurer, **Mr. E. R. Davies,** and the honorary secretary, **Dr. B. P. Dudding,** were re-elected. **Prof. H. W. Thompson** joins the Board as the new representative of the Faraday Society.

As from July 1, **Mr. Kenneth Noble,** A.M.I.E.E., has taken up an appointment as senior assistant in the Chief Commercial Officer's Department of the Eastern Electricity Board at Ipswich. Since April, 1948, Mr. Noble has been consumers' engineer at Hastings. He served his apprenticeship with a firm in Hull, later joining Hull Corporation electricity undertaking. In 1946 he became assistant consumers' engineer at Hastings. He was promoted to consumers' engineer when the undertaking was taken over by the South-Eastern Electricity Board.

Dr. R. G. Jakeman, D.Sc.(Eng.), M.I.E.E., M.Amer.I.E.E., chief designer in the engineering department of the General Electric Co., at Witton, is to retire at the end of this month. He joined the design department at Witton 43 years ago and was appointed chief designer in 1933. In this capacity he has been responsible for the electrical design of a.c. and d.c. machines of all types, and at one time was concerned particularly with the development of rotary and motor converters. Dr. Jakeman has served on many technical committees, including those of B.E.A.M.A., B.S.I. and E.R.A.

Dr. R. G. Jakeman

Lucky girl from the electrical industry, chosen to attend a Royal garden party, is **Miss Ethel Webster,** who is a typist at the Manchester office of George Ellison Ltd. She was chosen from hundreds of branch secretaries to represent the Girls' Friendly Society at Buckingham Palace on Thursday of last week. Miss Webster has been with George Ellison's for five years, although she has only just celebrated her twenty-first birthday. Whilst in London she was entertained by the company's London office staff.

Miss Ethel Webster

At the end of this month, **Mr. C. Cooper,** A.M.I.E.E., retires from his position of station superintendent at Woolwich generating station, London Division, B.E.A.—a position he has held since 1931. He studied at the City and Guilds Central Technical College, S. Kensington, joining the Luton power station of the Chatham Tramways as charge engineer in 1906. Two years later he went to the Woolwich Electricity Department and was, for three short periods, at their Plumstead generating and destructor station, which was closed down as a power station about 1923. He was also, for a time, charge engineer at the Woolwich station. Mr. Campbell was president of the E.P.E.A. in 1935, and as a member of the National Executive sat on practically all the national sub-committees of the association at one time or another. We join his friends in wishing him a long and happy retirement.

Mr. C. Cooper

At present with the A.E.I. Network Analysis Department, **Mr. K. W. Wardrop,** B.Sc. (Eng.), next month takes up duties as third assistant engineer in the transmission design department at B.E.A. headquarters, in Winsley Street.

About the middle of October, **Sir George Usher,** managing director of International Combustion, Ltd., and chairman of Aberdare Cables Ltd., will go with Lady Usher to South Africa where he plans to make his future headquarters. They returned from that country earlier this month.

A recent arrival in this country is that of **Mr. S. Blackley,** chairman of Turnbull and Jones Ltd., an old-established electrical engineering and merchandising company in New Zealand. Mr. Blackley is here with his family and hopes to combine business with pleasure. In addition to his directorship of Waygood-Otis (New Zealand) Ltd., Mr. Blackley is a past chairman and a member of the Hull Valley Electric Power Board, a member of the Town Planning Board of New Zealand and a member of the executive committee of the Electric Power Boards Association of New Zealand.

New chairman of B.E.A.M.A.'s Publicity Committee is **Mr. D. G. Denoon,** F.I.A.M.A., joint publicity manager of British Insulated Callender's Cables Ltd. Mr. Denoon has been closely connected with technical publicity in the electrical industry since 1934, when he became publicity manager of Callender's Cable and Construction Co. He was trained as an engineer and, following service in the R.F.C. during the 1914-1918 war, he joined the Callender Co. in 1924. When the two companies merged in 1945 to form B.I.C.C., Mr. Denoon became joint publicity manager of the group, with responsibility for public relations, printed publicity and press advertising. His special interest is the development of illustration technique in technical publicity work. He is a member of the Trade and Technical Press Vigilance Committee of the Incorporated Society of British Advertisers Ltd., and also of the Publicity and Exhibitions Committees of the Cable Makers Association.

Mr. D. G. Denoon

In succession to **Mr. H. F. G. Woods,** B.SC., M.I.E.E., M.I.MECH.E., who is retiring after nearly 45 years in the supply industry, **Mr. R. H. Upton,** M.ENG., M.I.E.E., A.M.I.MECH.E., has been appointed district manager, East Devon, in the Devon sub-area of the South-Western Electricity Board. Mr. Woods, the retiring district manager, graduated at University College, London, and after a post-graduate course with the B.T.H. Co., joined the Southend-on-Sea undertaking. In 1919 he became borough electrical engineer and manager at Torquay, and in 1929 was appointed technical advisor to Whitehall Securities Corporation Ltd. and engineer and manager to the newly formed Electricity Supply Companies of the Exe Valley group. On vesting day he became senior executive officer, Exe Valley, and for the past year has been district manager, Exe Valley and East Devon. His successor, Mr. Upton, took his degree at Liverpool University, and became a student-apprentice with Standard Telephones and Cables Ltd. After three years with the Yorkshire Electric Power Co., he served with the York, Ealing and Ipswich Corporation Electricity Departments, and in 1946 was appointed chief electrical engineer to Plympton R.D.C. He became senior executive officer, Plympton, at vesting day, and last year was appointed district engineer, Plymouth.

Mr. H. F. G. Woods

Mr. R. H. Upton

An interesting ceremony took place at the Trafford Park works of W. T. Glover and Co. Ltd. last Thursday when **Mr. H. Allcock,** M.I.E.E., M.I.MECH.E., M.AMER., I.E.E., export manager, was the recipient of a presentation to mark his completion of fifty years' service with the company. The presentation was made by **Mr. T. H. Martin-Harvey,** chairman of the company, supported by the directors, **Messrs. P. V. Hunter, W. C. Handley,** and **Mr. D. J. Hollingsworth,** the general manager. Mr. Allcock has occupied his present position for the past thirty years, and in that capacity, has travelled widely. In his

Mr. T. H. Martin-Harvey, on Mr. Allcock's left, addresses the Glover gathering

younger days he was the first electrical engineer of the Trafford Park and Light Supply Co. when its generating capacity was 1,200 kW (that station is now known as Stretford). He is also known to his many friends as the "Decimal King" because of his advocacy of the metric system, and as chairman of the Decimal Association he gave evidence before the Royal Commission on Decimal Coinage, whose report was published in 1920. Mr. Allcock has been a vice-president of the British Engineering Association, and of the F.B.I. on the Grand Council of which he has served as a member.

Ekco-Ensign Electric Ltd., have announced the appointment of **Mr. S. Braithwaite,** 66 Greenfield Avenue, Appleton, Cheshire, as representative covering south-western Lancashire. He will be based at the company's northern office at Kent Street Works, Preston, Lancashire.

Latest appointment to membership of the South East Scotland Electricity Consultative Council is that of **Provost George C. Gilbert,** of North Berwick. The announcement by the M.o.F. and P. states that Mr. F. J. Dawson has automatically retired from the Council on ceasing to be a member of the Lower Town Council.

Mr. F. R. Moberly, A.C.A., secretary to Richardsons, Westgarth and Co. Ltd., has been elected to a seat on the Board.

We hear that **Mr. S. F. Rogers,** until recently a representative of Smart and Brown (Engineers) Ltd., has joined the staff of Herman Smith Ltd., of Dudley. He will cover the area of N. Wales and part of the city of Birmingham.

Formerly electrical engineer and manager of the Ilkley U.D.C. Electricity Department, **Mr. C. E. D. Greenhalgh,** M.I.E.E., has been asked by the council to act as part-time adviser in street lighting, housing installations and other electrical matters. Mr. Greenhalgh is resident manager No. 1 Sub-Area of the Yorkshire Board at Ilkley.

Amongst new elections to Fellowship of the Institution of Works Managers are those of many members of the electrical industry. Elected on the recommendation of branch committees because they are "men of distinction in the practice of works management" are **Mr. J. Ayres,** a director of the Brush Electrical Engineering Co. and manager of the Loughborough works; **Mr. H. Dreghorn,** superintendent of the Rugby works of B.T.H.; **Mr. H. J. Farmer,** superintendent of the Control Gear factory of B.T.H., Rugby; **Mr. E. D. Galloway,** assistant to the manager of Henry Wiggin and Co.'s Glasgow works; **Mr. R. J. Herd,** works manager to Mavor and Coulson Ltd., Glasgow; and **Mr. H. L. Satchell,** a director of B.T.H. and manager at the company's Rugby works.

Mr. W. N. Carey, of No. 2 Sub-Area, Bolton district of the North-Western Electricity Board, **Mr. W. M. Pitcher,** of No. 5 Sub-Area, Bungay district of the Eastern Electricity Board, and **Mr. A. Brown,** of the North Staffs Sub-Area, Stoke district of the Midlands Electricity Board have been awarded the Sales Engineers' Diploma of the Electrical Development Association.

Mr. H. D. McGough has been appointed by the General Electric Co., Ltd., as their manager in Eire. He joined G.E.C. in 1915 and spent a year at the company's head office before his appointment as manager of the Osram Lamp Department in Belfast. In 1922 he joined the Dublin branch of the company as assistant to the late Mr. W. A. Mombrun and was in charge of various departments there. Mr. McGough is hon. organiser and secretary of the E.I.B.A. centre in Eire.

In our reference to the resignation of **Mr. C. K. Pitt** from the board of Verity's, Ltd., which appeared in last week's issue of the ELECTRICAL TIMES, we unfortunately omitted the second initial. We should point out that this note did not refer to **Mr. C. J. Pitt,** who is chairman and managing director of the company.

It is now announced that **Mr. P. J. Ryle,** B.Sc.(Eng.), will serve on the council of the Institution of Electrical Engineers as chairman of the North Eastern Centre for 1950-51 in place of **Mr. A. Watt,** who has resigned due to his being transferred to London.

OBITUARY

The death occurred recently of **Mr. C. Crymble** A.M.I.E.E., lecturer in electrical engineering at King's College, Newcastle-upon-Tyne.

The death occurred last week of **Mr. David Mann-Fraser,** A.M.I.E.E., director of Sun Electrical Co., Ltd., and manager of its Northern Area Branches. Apprenticed to Wm. Beardmore and Co., Ltd., of Glasgow, he afterwards went into business as an electrical contractor. After outstanding service with the Royal Engineers in the 1914-18 War he joined John Birch and Co., Engineers, of Moorgate, E.C., and in 1923 joined the Sun company as their Leeds branch manager. He became a director in 1944. Mr. Fraser was a founder member of the Leeds Electric Club and past chairman of the Yorkshire section of the Electrical Wholesalers' Federation.

We note the death on July 23 of **Major Geoffrey Brooke,** aged 60, formerly chairman and managing director of Holden and Brooke, Ltd.

WILLS.—**Mr. Vernon Hope,** J.P., chairman and managing director of Parmiter, Hope and Sugden Ltd., left £157,990 (£150,343 net value).

Mr. C. Read, district engineer of Pirelli-General Cable Works Ltd., in South East England and East Anglia, left £1,275 (£1,171 net value).

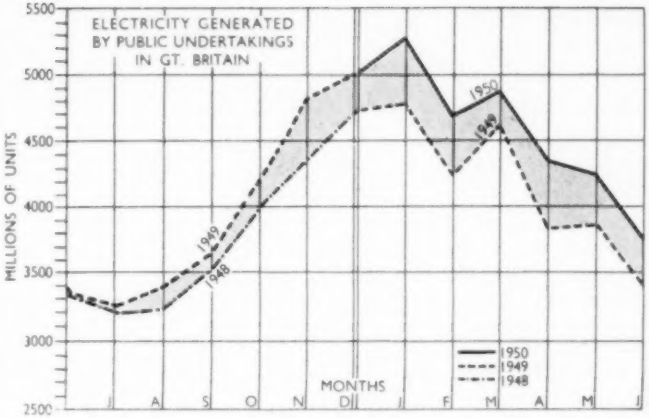
Mr. H. G. Redfern, formerly superintendent of Chadderton and Greenhill generating stations, Oldham, left £3,517 (£3,355 net value).

UNITS GENERATED

During the month of June, 1950, a total of 3,759 million units was generated in stations under the control of the B.E.A., the North of Scotland H.E. Board and the Lochaber Power Co. The corresponding figure last year was 3,394 million, so there has been an increase of 10·8%.

Of the total, 3,665 million units were generated in steam stations and 79 million in hydro-electric.

Energy sent out during the month was 3,539 million units, 94·2% of that generated. This gives the total for 1950 so far as 25,671 million units, an increase of 10·2% on the corresponding period in 1949.



POWER SUPPLY IN JUNE

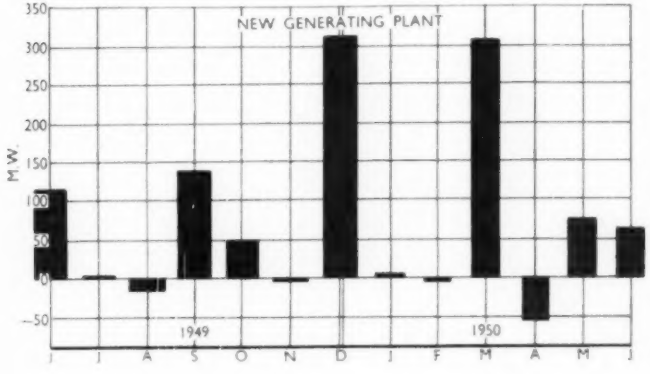
AS for last month, two sets account for most of the 62 MW increase in installed capacity recorded by the B.E.A. for June. They are both 30 MW machines, one a B.T.H. set at Walsall (Midlands Division) and the other by Parsons, at Rotherham (Yorkshire Division).

Several boilers were also commissioned, and these combined with the sets caused the MW sent out capacity to be increased by about 111. They included the fourth 265 klb/hr International Combustion unit to be installed at Littlebrook "B" in the South-Eastern Division, while the Midlands Division gains a 525 klb/hr slag-tap Stirling boiler at Stourport "B" and a sixth 150 klb/hr B & W unit at Walsall. In the East Midlands Division, Nottingham and Staythorpe are the two stations affected, the first adding a 320 klb/hr International Combustion equipment and the second a 240 klb/hr B & W boiler.

Two stations are also concerned in the Yorkshire Division, Rotherham, which has the set mentioned above, and Ferrybridge, where the third of four 180 klb/hr Mitchell boilers has been commissioned. Finally comes Dunston "B", in the North-Eastern Division, with the first of two 400 klb/hr B & W units which are scheduled for installation.

Units Sent Out

At the halfway mark of the year's total it is interesting to note that units sent out are 10·2% above last year's total. The increase has resulted from increased steam plant generation, for the hydro-electric total is almost the same as for last year. So far this year 15,747,000 tons of coal have been consumed, 8·1% more than in 1949.



GENERATING PLANT

At the end of June, 1950, the installed generating capacity of the B.E.A. was 13,926 MW, 62 MW more than at the end of April. The North of Scotland total has remained steady at 379 MW, and thus the figure for overall increase in the last twelve months becomes 866 MW, or 6·4%.

The installed capacity, used for the purpose of this diagram should be distinguished from the output capacity. The installed capacity is the total m.c.r. of all the generating sets which are connected on both steam and electric sides and are suitable for use.

Varnish Drying on Enamelled Wires*

—*Application of Infra Red Installations*

THE following describes a typical recent installation for this specialised paint drying and stoving duty by infra-red radiation of enamelled wire.

Varnish stoving by infra-red radiation on metals, is practised on a wide scale today, when it is a question of surfaces that can be irradiated in a uniform manner. Objects of complex shape can also be processed, but they necessitate some adaptations and present some complications. Greater difficulties still are encountered, when it is a question of stove enamelling bicycle frames or other parts of wire-like shape which only present a low radiation diagrammatic representation of a unit in industrial use consists of 32 I.R. Mazda electric radiating lamps, each lamp of the spherical type, 250-watt loading. The equipment permits of treating each day about 12 miles of wire coated with a spirit varnish. The results obtained are very interesting, because the interior drying in the varnish film results in an improvement in the electrical insulating properties of the wire coating and greater mechanical hardness is obtained, as compared with drying in convected warm air. The wire can be stacked immediately after passage through the stoving tunnel.

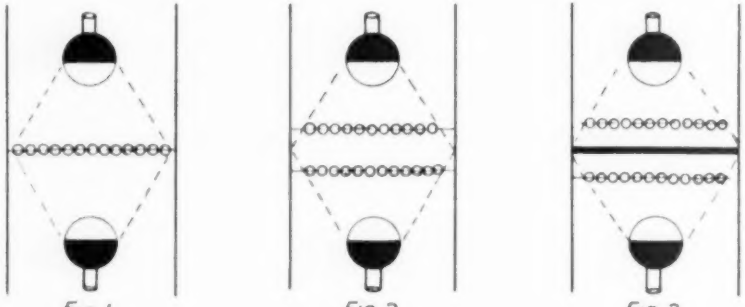


Fig. 1. Arrangement of a row of wires between two banks of lamps with a simple pass-through. Fig. 2. Arrangement with pass and return under the lamps. Fig. 3. The lamps may be opened out and reflection passing between the wires thrown back by a centre sheet of aluminium

receiving surface, with respect to the radiation producing lamps.

Problems of this kind, however, can be resolved in a perfectly satisfactory manner, with the reservation that stoving plant of a suitable design for the purpose is installed. In the case of enamelled wire, for example, this can be passed in relatively close ranks, as a bank between two rows of lamps so as to ensure a correct utilisation of the radiation (see Fig. 1).

In Figs. 2 and 3 are shown a further development of this initial conception, for drying enamelled wire. This installation, which is a

The distance between the lamps and the wire is of the order of 20 cm. In those cases where it is desired not merely to dry, but rather to cure the coating, it will obviously be necessary to work under a stronger radiation effect. For example, where Bakelite varnishes are being cured on wires, the lamps will need to be banked at 15 cm. between axes; more concentrated, floodlight, parabolic lamps will be required and the wire will pass at 4 to 6 cm. below the lamps, in place of 20 cm. in the case of the drying process.

* M. De Buccar, Peintures, Pigments-Vernis, vol. 25, No. 7, p. 263.

The BUYER'S *Column*

Choose Your Solder

SAMPLES of "Ersin" and "Arax" cored solders are to hand from MULTICORE SOLDERS LTD., of Mellier House, Albemarle Street, W.1. The variety of grades include 40/60 tin-lead in 13 and 16 s.w.g. for electrical and radio work, and 60/40 high-tin television and radio qualities in 18 and 14 s.w.g. sizes, all with "Ersin" 3-core-activated resin flux. Grades with "Arax" non-resinous flux which, it is claimed, will solder blued steel, include metal mending (40/60 alloy) and model maker's (60/40) alloy) qualities. These grades are normally available in two sizes of cartons, retailing at 6d. and 5s. respectively. A convenient kit containing small cartons of the two alloys in both "Ersin" and "Arax," with hints on soldering and a leaflet of useful electrical and radio data, retails at 2s. and should provide a popular selling line.

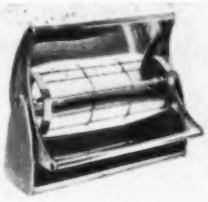
Tested Toaster

THROUGH the courtesy of the manufacturers, we have recently had the opportunity of carrying out an extended examination and tests on the "Roevac pop-up" toaster, manufactured by ROEVAC METAL PRESSINGS LTD. of 329/366 Stretford Road, Manchester 15.

Its reasuringly solid appearance is in no way belied by its internal construction which is of stout pressings bolted together, with a robust and simple toggle release for the "pop-up" feature which also actuates a built-in switch. An air dashpot is used for the timing mechanism, which is continuously adjustable and protected against damage by forcing the adjusting knob too far. In operation, it gives consistent results, two average slices of bread being toasted in approximately two minutes, the actual time varying according to the moisture content of the bread and the type of toast preferred. Another good feature is that crumbs are not spilt over the tablecoth but are readily emptied when required through a door provided in the base.

With a loading of 1,200 W, and finished in chromium plate, the Roevac toaster is listed at £5 15s.

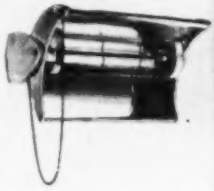
The "Roevac pop-up" toaster



The "Crosby" Fire

Feeling Chilly?

ALTHOUGH the man in the street may not yet be interested in electric fires, those who cater for his wants must be well ahead of the season, and ELEXCEL LTD., of Victor Works, Broadgreen, Liverpool 14, are already issuing their new season's folder. Illustrated are the "Crosby," a 1 kW reflector model in golden bronze enamel with chromium reflector which is listed at £3 10s. (plus £2 11s. 6d. p.t.), and the "Bathroom" model. This is finished in white stove enamel, and has cord attachment and wall mounting bracket, and is listed at the same price. Other models listed are the "Sefton," the "Speke," the "Clifton" and the "Buxton," together with two "Cosyglo" imitation fires, the "Calder" with log effect and the "Woolton," which imitates a coal fire.



The "Bathroom" Fire

The Egaspray

OUR account of the "Egaspray" airless paint gun in last week's issue unfortunately omitted the address of the manufacturers, and we regret the inconvenience caused to a number of inquirers. The address of EGA DEVELOPMENTS LTD. is Holyhead Road, Wednesbury, Staffs.

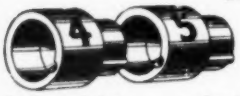
New Three-Wheel Tractor

FROM BRUSH COACHWORK LTD., Loughborough, we have details of their new three-wheel drive battery-electric tractor. Designed for towing trailers of up to eight tons, it is particularly applicable to power stations, railways, dockyards and heavy industries generally. With a total length of 9 ft 6 in., a width of 4 ft 2 in. and a height of 4 ft, it weighs 17 cwt without battery, or 32 cwt with standard 268 a.h. battery.

The Brush 3-wheel tractor

Two motors are employed, one driving the two rear wheels and one the front. Both are rated at 2·3 h.p. (one hour rating). Since the front wheel is power driven, it is possible to operate at 90° steering lock, in which case the turning circle is approximately 8 ft radius, thus giving maximum manoeuvrability. Range varies from 60 miles light to 15 miles pulling six tons on the level with a drawbar pull of 240 lb, and the speed is stated to be 8 m.p.h. on the level (light). On a gradient of 1 in 14 with a three-ton load (drawbar pull 600 lb) the speed is given as 3·35 m.p.h. A prototype was shown at the recent Mechanical Handling Exhibition.

Got the Right End?



IDENTIFICATION of switchboard wiring and cable connections is facilitated by a new plastic ferrule designed by CRITCHLEY BROS., of Brimscombe, Gloucester. Large stocks of different engravings are eliminated by utilising a separate ferrule for each number, so that 1,000 different identifications can be built up, using only ferrules numbered from 0-9. Each unit is moulded with a keyway into which the next ferrule fits, thus preventing rotation and ensuring that the figures remain in line. Black on white or white on black or other colours can be supplied, and figures can be engraved for either hand, as required.

TRADE PUBLICATIONS

BOILER CORROSION. The paper, "Boiler Corrosion and Boiler Feed Water Treatment," which Mr. H. Hillier, O.B.E., M.I.Mech.E., read before the Institute of Marine Engineers last November, has now been issued in reprint form and is available from G. and J. Weir Ltd., Cathcart, Glasgow S.4.

THE OUTSHINING LIGHT. The Lighting Section of the British Thomson-Houston Co. Ltd. have issued the summer, 1950, issue of *The Outshining Light*. Articles include "Lighting an Art Gallery" and a comprehensive review of progress in street lighting by G. K. Lambert, B.Sc.(Eng.), A.M.I.E.E., and H. E. G. Watts, A.M.I.Mech.E.

MOTOR PROTECTORS. "Reduce Motor Costs" is the slogan used in the title of a new folder illustrating and describing "Klixon Motor Protectors," which are made by Salford Electrical Instruments Ltd., Silk Street, Salford 3, Lancashire. After a study of the folder, readers will appreciate the point of this slogan.

CONVECTOR HEATERS. Pleasant uniform heating is one of the results of installing "Chalex" convector heaters which are illustrated in a new leaflet issued by C. Hounslow and Co. Ltd., Chalex Works, Southwick, Sussex.

OIL FILLED ELECTRICAL RADIATORS. Thermostatically controlled "Dimplex" oil filled electric radiators are described in new folders issued by Habin Ltd., "Dimplex" Works, Totton, near Southampton.

CARBON BRUSH EQUIPMENT.—Carbon brushes, carbon components, controller parts, and contacts and brush holders, are the subject of a folder of specification sheets issued by the Synthetic Carbon and Engineering Co. Ltd., Cumberland Road, Stanmore, Middx.

EMERGENCY LIGHTING. "Hart" automatic emergency lighting equipments are surveyed in a new brochure issued by the Hart Accumulator Co. Ltd., Stratford, London E.15.

FANS FOR INDUSTRIAL USE. "Mechanical Draught" is the title of publication No. 3501 issued by the Sturtevant Engineering Co., Ltd., Southern House, Cannon St., London E.C.4. It surveys the use of electric fan equipments for providing forced air draughts in boiler plant.

WOOD POLE PRESERVATION. Attractive booklet issued by the Bowthorpe Electric Co. Ltd., Crawley, Sussex, surveys the Bowthorpe system of wood pole preservation which helps arrest ground line decay for under one penny per injection.

EYE SAFETY. "Panorama" type safety goggles, eyeshields and face masks moulded in acrylic plastic telescopic drill guards, safety drum openers and push sticks are described in a booklet issued by Stratford Products Safety Service Co. Ltd., 98 Tower Bridge Road, S.E.1.

ELECTRICAL HAND AND FACE DRYER. The Factory Act stipulates that adequate washing facilities be provided for workpeople. Laundry problems are sometimes great, but when a "Crypto" dryer is installed there are no such problems. Leaflet CL72 issued by Crypto Ltd., North Circular Road, London, N.W.10, describes these installations.

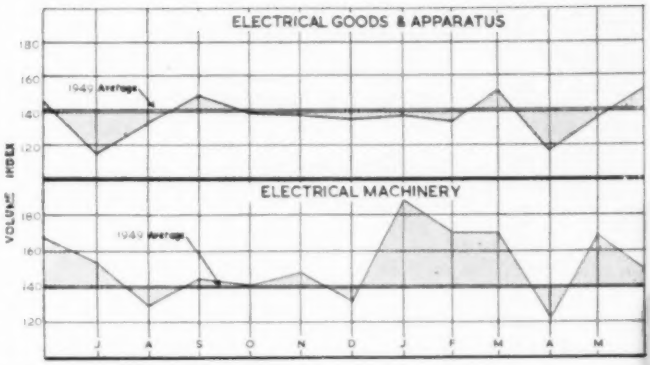
TELEPHONE RELAYS. General notes on the design, performance and available features of telephone relays which make them suitable for general applications are given in Engineering Bulletin No. 430, issued by the Automatic Telephone and Electric Co. Ltd., Strowger Works, Liverpool 7.

EXPORTS AND IMPORTS

EXPORT VOLUME INDEX

Trade returns for June show that £7,388,434 was the value of electrical goods and apparatus exported during the month, while for electrical machinery the corresponding figure was £3,503,043. Adjusted for price changes since 1947, these values are equivalent to 151% and 150% respectively of the average export rates achieved during that year.

Export targets are no longer issued by The Board of Trade, and so comparison is made with the average rate of exports during 1949.



THERE was again a slight increase in the total value of all electrical goods exported during the month of June—the grand total being £11,397,378 compared with £11,060,938 in May, and only £518,311 behind the record figure of March last. During the month there was a rather sharp drop in the value of wireless equipment sent abroad, but the balance was maintained by increases in other items. The convertors, transformers, rectifiers group again maintained its good average—the value of transformers alone amounted to £546,043 for June, with rectifiers accounting for £39,357, starting and control gear £230,213, and switchgear £895,698. Of all electrical goods sent oversea during the month India alone took a total value of £3,654,558; Australia took £1,546,511; South Africa £1,396,968; New Zealand £640,965 and Canada £174,819. The corresponding figure for the Soviet Union was £97,321.

Description	Exports Value Month of June			Imports Value Month of June		
	1948	1949	1950	1948	1949	1950
	£	£	£	£	£	£
Telegraph and Telephone Wires and Cables—						
Submarine	5,876	118,596	125,179			
Other	766,794	558,886	664,937	12,758	4,170	8,800
Rubber Insulated	504,055	484,661	362,766			
Insulated, other than Rubber	943,650	1,086,012	746,009			
Wireless Apparatus, including Valves	890,512	860,989	925,692	54,970	70,796	171,673
Telephone and Telegraph Apparatus	1,071,248	1,285,507	1,618,895	9,082	6,923	10,777
Electric Lighting Appliances, Accessories, Fittings and Parts—						
Bulbs and Discharge Lamps	152,462	171,132	133,097	7,789	8,611	27,437
Other Descriptions	425,085	470,354	352,381	8,436	7,132	21,723
Batteries (primary)	79,047	64,402	153,367	—	—	—
Accumulators, Portable	212,329	260,730	305,440	—	—	—
,, Stationary	42,584	25,321	50,136	—	—	—
,, Parts and Accessories	47,970	86,742	74,497	—	—	—
Electrical Cooking and Heating Appliances	314,664	274,509	274,000	—	—	—
Ammeters, Voltmeters, etc., and Parts	70,555	99,358	111,060			
House Service Meters	185,041	116,295	131,332	32,004	19,806	44,495
All Other Instruments	90,506	70,168	147,633			
Electro-Medical Apparatus	28,021	35,990	35,652	—	—	—
X-Ray Apparatus, etc.	39,591	47,737	54,394	30,689	38,263	29,856
Insulating Materials	137,266	180,860	168,200	—	—	—
All Other Articles	368,744	416,562	491,768	73,270	66,974	134,595
TOTAL OF GROUP	6,587,710	6,917,491	7,388,434	228,998	223,675	446,356
Electrical Machinery—						
Generators (not exceeding 200 kW)	237,984	992,459	502,505			
,, (exceeding 200 kW)	69,451	156,532	350,957	21,691	8,442	33,872
Parts	194,329	108,615	218,615			
Motors	561,664	943,801	675,857	23,487	24,942	90,901
Convertors, Transformers, Rectifiers, Motor Control Gear, Switchgear, other machinery	1,029,470	1,605,208	1,755,119	17,352	14,953	24,151
Fans, Electrically and Power Driven	89,761	104,353	139,942	—	—	—
Vacuum Cleaners or Electrically-operated Appliances	247,383	310,142	307,039	16,713	4,545	6,389
TOTAL APPLIANCES AND MACHINERY	9,016,752	11,138,601	11,338,468	308,241	276,557	601,669

THE WEEK

INDUSTRY *in news* COMMERCE

R.E.C.M.F. Exhibition, 1951

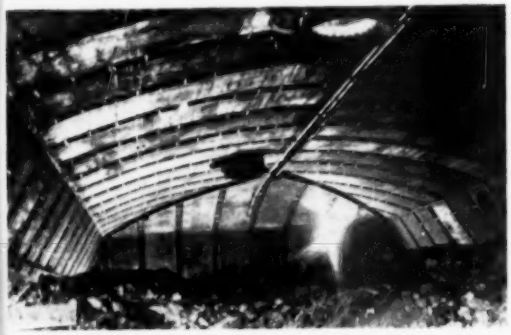
EIGHTH annual private exhibition of British components, valves and test gear for the radio, television, electronic and telecommunication industries will be held in the Great Hall, Grosvenor House, Park Lane, London W.1, from Tuesday, April 10, to Thursday, April 12, 1951.

Admission will be by invitation only, and further details will be issued in due course by the organisers, the Radio and Electronic Component Manufacturers' Federation, 22 Surrey Street, Strand, London, W.C.2.

a message from the Minister, Mr. Strauss, declaring: "The application of electronics to industry is doing much to increase industrial efficiency."

The exhibition included an apparatus for determining the time-keeping qualities of watches and clocks, the ticks being recorded on tape, and an ignition tester for motor-cars.

The valuable industrial application of electronic devices was shown by equipment for measuring the moisture content of textiles, and the electronic hygrometer, for measuring humidity of atmosphere or gases.



As we reported last week work has commenced on the sinking of a caisson at Uskmouth. This view, taken underneath the working chamber roof on one compartment shows the access shafts, high pressure and low pressure airlines and 25 volt lighting circuits

Pay Rise in Scotland

UNDER a recent decision of the National Arbitration Tribunal, wiremen in the electrical contracting industry in Scotland receive a 1½d. per hour increase as from this month. The new hourly rates are: journeymen electricians, 3s.; fifth year apprentices, 1s. 10½d.; fourth year apprentices, 1s. 6½d.; third year apprentices, 1s.; second year apprentices, 9d., and first year apprentices, 6d.

Applied Electronics

SOME of the latest and most interesting developments in the field of applied electronics were illustrated at the annual exhibition of the North West branch of the Institution of Electronics, which opened last week at the College of Technology, Manchester.

Mr. Alfred Neate, Regional Controller, Ministry of Supply, who opened the exhibition, read

B.E.A. Exhibition Proposed

EMPLOYEES of B.E.A. and the Area Boards are to be invited to compete in a national arts and crafts competition. Planned as a "family affair," retired employees are eligible as well as wives, husbands and children of present employees.

N.E. Division has already arranged an exhibition to be staged in Wallsend on September 16. The final display will be open to the public and probably held in the Horticultural Hall, London, early next year.

Submarine Cables Centenary

ALMOST one hundred years ago—on August 28, 1850—the first submarine cable was laid between Dover and Calais. Notwithstanding the pessimism of a large number of critics of the scheme, undersea telegraph com-

The First Half-Century

Yesterday four weeks, our Central London Railway, that was already years behind contract time, was opened by the Prince of Wales. Yet tens of thousands of would-be passengers are still exasperated by the sight of locked station gates, and the stale old placarded announcements: "Will be opened shortly." Paris, too, has its underground electric railway, from Vincennes to the Porte Maillot. This was opened last Thursday, not ceremonially, but actually, with such an absence of fuss that the first day or two passengers were few, the public being unaware that traffic had begun.—*From our issue of July* 26, 1900.

munication with countries abroad had become an accomplished fact.

In the Science Museum at South Kensington a special exhibition to commemorate the centenary is to be opened on August 28. Closely associated in this project is the Telegraph Construction and Maintenance Co., whose forerunner, the Gutta Percha Co., formed in 1845, made the original Dover-Calais cable.

The Telcon organisation also marks the occasion by celebrating its own centenary, deferred from 1945 owing to war conditions, and an "open day" has been arranged at Telcon Works, Greenwich, with a centenary dinner at the Dorchester Hotel.

The technical superiority established for Britain in 1850 by the Gutta Percha Co. has been maintained by its successors. The record of the Telcon organisation, whose submarine cable interests were merged in 1935 with those of Siemens Brothers and Co. by the formation of Submarine Cables Ltd., shows a continuous and successful use of new methods of insulation, armouring and manufacture, and the development of new types of cable.

In 1949, 3,500 miles of submarine cable were manufactured at Telcon Works. The total output of Submarine Cables Ltd. and its parent companies since Telcon produced the first successful Atlantic cable in 1866 is very nearly half a million nautical miles—90% of world production.

Uniform Lighting in London?

SHOULD London have a uniform system of street lighting? Because most of the London sub-area consultative committees have stressed the desirability of a uniform system of street lighting, a report on the subject was submitted at the full meeting of London consultative council recently.

The council, pointing out that the responsibility for street lighting rests with the local authorities and the Ministry of Transport, comments: "It is understood that the Board will take such steps as are within their power to promote the early achievement of such uniformity."

At Church Road, Liverpool, 68 Siemens' "Sola-Sieray" single-plate refractor lanterns, mounted on Concrete Utilities' columns, have just been installed

Morganite transfer Employees

MORGANITE Resistors Ltd., Jarrow, manufacturers of resistors, volume controls, etc., are to increase the number of employees at their Jarrow works from 300 to about 450. This will be done by transferring to Jarrow certain work at present carried out in other parts of the country.

Morganite Resistors began production at Jarrow about three years ago. A large proportion of their products are directly exported and others are incorporated in radio sets, radar sets, etc., made by other firms for export.

(Left) Fluorescent lighting in Granville Court Hotel, Bournemouth. Our photo, of the dining room, shows Mazda louvred units with Perspex side panels housing Mazda-mellow lamps

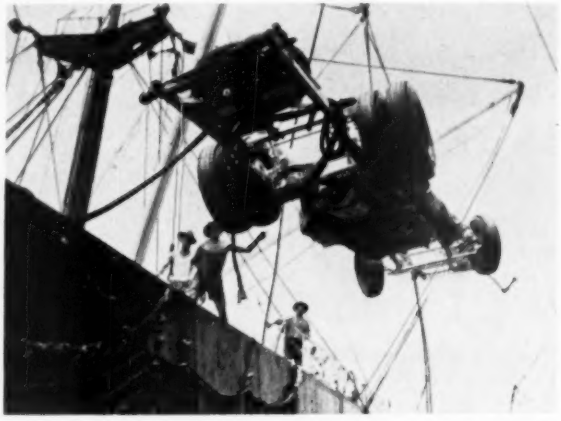
(Right) Fluorescent lighting in a restaurant requires special handling. At the Stoll Theatre restaurant, Atlas "Peach" lamps are housed in twin 40-W fittings with reeded diffusing covers

Overseas Orders—

B.T.H. have received an order for two electro-magnetic couplings and a twin-pinion single-reduction gearbox for a new 9,000 s.h.p. motor ship. The vessel has been ordered from Messrs. Alexander Stephen and Son, Ltd., of Glasgow, by the New Zealand Shipping Co., Ltd., and will be propelled by two 4,500 h.p. 225 r.p.m. Sulzer engines.

Several couplings of this type have already been built by B.T.H., but the two now on order are among the largest individual electro-magnetic couplings in the world. The gearbox is to be of fabricated construction, and each pinion is mounted on a hollow quill shaft—a solid interior shaft being flange-coupled to the quill at the after end and supported by a third outer-bearing forward. This arrangement prevents any deflection, caused by the overhung weight of the coupling interfering with the meshing of the high precision gears.

Features of the electro-magnetic coupling are its simplicity of operation, reliability and robustness. Its effective damping properties make the coupling an ideal method of isolating the torsional oscillations of diesel engines from the gear teeth.

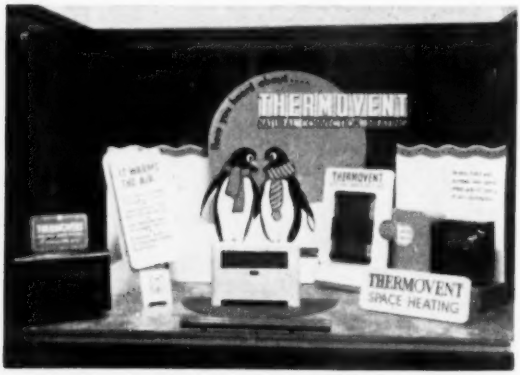


Soon to be running in Brisbane—one of the new trolley-bus chassis being unloaded at the docks

. . . for Australia

THE FIRST of 30 trolleybus chassis fitted with B.T.H. traction equipment to the specification of Brisbane City Council department of transport has now arrived in Brisbane, Australia. They will be the first trolleybuses to operate in Queensland. The B.T.H. electric equipment is of the non-regenerative type with stabilised-rheostatic braking, the compound wound motors having a one hour rating of 115 h.p. at 550 volts. Electro-magnetic contactors operate from the 550V supply through a master controller of the well-known "scissors" type (developed by B.T.H.), the controller being mounted under the driver's seat.

The rheostatic brake controller is also of the "scissors" type and is assembled in the same unit as the accelerating controller together with the hand-operated drum-type reverser. Starting and braking resistors are the B.T.H. Type RF which have been specially developed for traction service. They are made from an edgewise wound strip alloy having a negligible temperature coefficient and a high specific resistance, resulting in a comparatively large cross section and high heat capacity.



An attractive Thermovent (E. K. Cole Ltd.) space heater display recently installed in the window of a South West Scotland Board showroom

. . . for Brazil

METROVICK have just received an order for another ten electric locomotives for Brazil.

Fourteen 1,070 h.p. locomotives for the Mineira section of the Brazilian Railways (Rede Mineira de Viacao) in the State of Minas Geraes are already in hand, and ten similar locos have now been ordered for the Curitiba-Paranagua section (Rede de Viacao Parana Santa Catarina), which traverses the States of Parana and Santa Catarina. The new locomotives are 50-ton units of the Bo-Bo type, equipped with four 265 h.p. axle-mounted traction motors driving through rubber-resilient gears.

. . . for Canada

A SECOND large dollar order for television equipment, placed by the Canadian Broadcasting Corporation with Marconi's Wireless Telegraph Co. Ltd., means that Britain is to supply the entire studio and outside broadcasting television equipment to start a Canadian television service. Only a few weeks ago Marconi secured an order to equip two studios in Toronto and two in Montreal.

The new contract calls for two specially designed television outside broadcasting vehicles. The vehicles—complete television stations on wheels—will cost over 180,000 dollars.

Each is to be a three-camera station, using Marconi Mark II cameras, and will be fitted with full video, audio and radio link equipment. This enables the producers to send a vehicle to a given spot and have three cameras in action there, in a short time, sending pictures back to the main station through its own radio link transmitter.

. . . and Yugoslavia

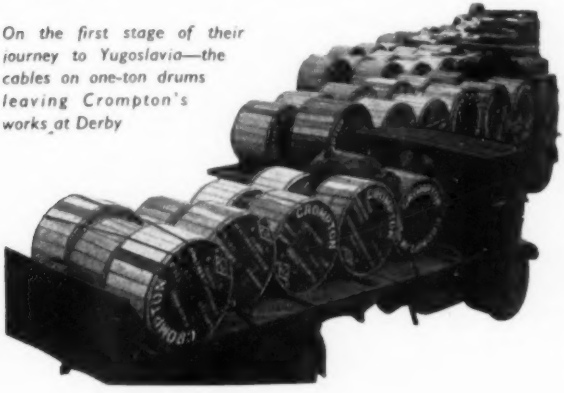
SIXTY-THREE miles of ship wiring cables worth over £30,000 recently left the Derby works of Crompton Parkinson Ltd., for Yugoslavia. The cables are to be used for a coastal shipping construction programme.

Because of limited handling facilities on one part of the journey the weight of each drum was limited to one ton. This meant that the cables had to be shipped on no less than 337 drums. Of different sizes up to 0·5 sq in., the cables are of standard design, made in accordance with the formulae of the Cable Makers' Association.

Gas Turbine School Re-opens

BRITAIN'S School of Gas Turbine Technology—the only one of its kind in the world—is reopening at Farnborough Place, Farnborough, next October.

The school, maintained by Power Jets (Research and Development) Ltd., has been moved because of expansion from its old premises at Lutterworth where Air Commodore Sir Frank Whittle's team designed and tested some of the earliest jet engines.



On the first stage of their journey to Yugoslavia—the cables on one-ton drums leaving Crompton's works at Derby

Small Electric Motors Ltd., of Beckenham, have just been advised by the Canadian Standards Association that their complete range of S.E.M. single and 3-phase motors has been fully approved. Our photo shows one of the firm's single-phase capacitor start motors

Instruction is given at the school in the use of gas turbines in high-speed aeroplanes, locomotives, road vehicles, ships, power stations, process power and other industrial applications. There are to be four different types of courses, one of which is an International course designed specially for overseas engineers.

Moving X-Ray Pictures

HIGH-POWER rotating anode X-ray tubes, improved lenses, and more sensitive photographic materials, all developed in recent years, have helped to make possible the production of continuous X-ray records of moving subjects. This week, a new h.v. cine-radiographic apparatus, developed by Watson and Sons (Electro-Medical), Ltd. (an associated company of G.E.C.), is being shown for the first time at the Sixth International Congress of Radiology in London.

The apparatus consists of an X-ray generator, controlled by an electronic contactor so that it is only energised when the shutter of a 35 mm camera is open. An X-ray image, projected on a fluorescent screen, is filmed by a special camera with frame speeds adjustable from 3-50 per second. Watson and Sons, working with Dr. Russell J. Reynolds, first produced an experimental moving X-ray picture in 1935.

School Presentations

Both Mr. Leslie Gamage (president of the schools) and the Hon. Mrs. Leslie Gamage (member of the Board of Management) were among the 400 guests who attended the speech day of the Royal Commercial Travellers' Schools.

Mrs. Gamage presented the prizes and was herself presented with an embroidered tablecloth in token of Mr. Gamage's efforts on behalf of the schools in 1949.

NEWS IN BRIEF

Camberwell is setting up a Festival of Britain committee to handle floodlighting and decoration of public buildings for next year.

Scientific Film Association is appealing for new members because of the large amount of voluntary work surveys and investigations entail at present.

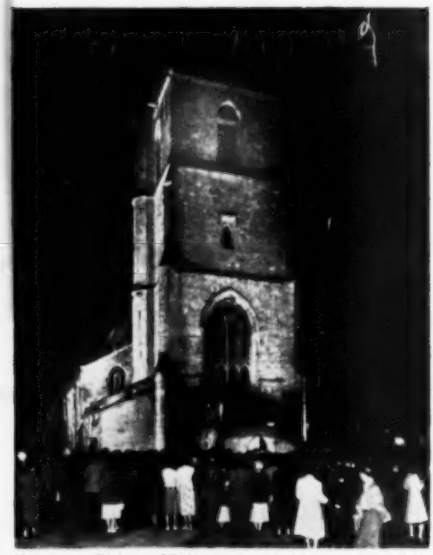
Radio equipment, consisting of a Pye 10-watt radio telephone using a five-valve transmitter and an 11-valve receiver, is being used by London Transport to speed up dispatch of relief vehicles.

What is Electricity? A new E.D.A. book in the educational series asks the question in its title, and J. A. Stedman, E.D.A. education officer, assisted by Dr. P. Dunsheath, provide the answer with helpful notes for the teacher.

More than 1,000 employees of Oldham and Son Ltd., the battery makers of Denton, Manchester, were recently given a free day trip to Blackpool.

A system of fluorescent lighting, designed to give ample light on lower bookshelves, is to be introduced at Smethwick Library.

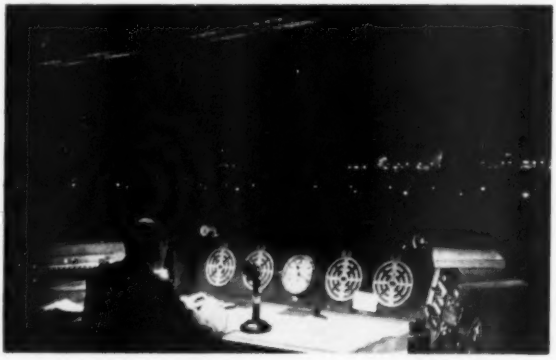
The Queen will open the Loch Sloy hydro-electric power station on the banks of Loch Lomond in the autumn.



When the Bishop of Salisbury made his annual walking tour of the diocese recently, Wareham Abbey was floodlit for the occasion. Floodlighting equipment was lent by the G.E.C.

Restoration of St. Pancras Church, Chichester, will include installation of an entirely new electric lighting system.

The third British Electrical Power Convention will be held in Brighton in 1951, during the week commencing June 18, under the presidency of Sir Henry Self, K.C.B., K.C.M.G., K.B.E., Comp.I.E.E.



Good lighting is essential for air traffic control posts. At Northolt instruments are lit by two Osram 221 m.m. 30-watt "Striplite" lamps. Reflectors of special design developed by the G.E.C. research laboratories confine the lighting to the control desk

Sheffield is experimenting with electric trucks for street cleaning. Three trucks with hydraulic tipping gear are replacing seven hired horses and carts. The trucks travel at about four miles an hour and the drivers walk alongside.

As a result of their annual dinner dance and a golf competition, Mersey and N. Wales I.E.E. centre has raised £330 for the homes fund of the Institution's incorporated benevolent fund.

The British Welding Research Association is planning to build a fatigue testing laboratory costing £20,000 at Abington, near Cambridge, and an appeal to increase membership to help defray the cost is to be made.

Because radio reception in North Devon and Cornwall has deteriorated since the introduction of the new wavelengths, the Postmaster-General, Mr. Ness Edwards, has promised a deputation from North Devon that B.B.C. and Post Office technical advisers would investigate.

The 1951 British Industries Fair will be held from April 30 to May 11 at Earl's Court and Olympia in London, and Castle Bromwich in Birmingham. Closing date for applications for space is August 15.

A new social club has been opened in Birmingham for employees of the Joseph Lucas organisation.

Facilities are being extended to art school students to enable them to enter the annual window display competition run by E. K. Cole Ltd.

Questions in Parliament

Debate on B.E.A. Report

Opening the debate on the reports of the British Electricity Authority and the Area Boards in the House last Tuesday, Mr. Noel-Baker said that it was hoped that load-shedding next winter would be less onerous both in industry and in the home, than it was last year. The amount of electricity generated had almost doubled since before the war, yet there was still one quarter of the houses in this country without an electricity supply, but those who have it were using more current every year. As we went to press the debate continued: further details will be given next week.

Electric Fires

Mr. Llewellyn asked the Minister of Works whether his attention had been drawn to the large number of accidents caused by unguarded electric fires to old people and children, and whether he would consult with the trade with a view to ensuring that guards may be available to purchasers of electric fires. Mr. Stokes replied that the question was being examined by an Inter-Departmental Committee and that he would consider an approach to the trade in the light of any recommendations the committee might make.

Telephone Installations

In reply to a question by Mr. Carson, the Postmaster-General, Mr. Ness Edwards, said that 5,171,491 telephones had been installed up to March 31, 1950.

Television Coverage

When asked by Mr. D. Thomas which areas of the country remain to be covered for television after the erection of the transmitter at Cardiff, Mr. Ness Edwards replied that coverage had been planned by low-power transmitters located at Tyneside, Southampton, Northern Ireland, Aberdeen and Plymouth. It was impossible to say which other areas will be left uncovered until experience is gained of the operation of the five high-power and five low-power stations.

Electrical Installation Work

Mr. Baker White asked the Minister of Works if he was aware that there were now large stocks of all materials needed and adequate labour available for electrical installation work in houses and offices; and whether he would now abolish the restrictions on the amount of work which may be done. Mr. Stokes said in reply that the need for restriction on capital investment, as announced last October, still exists.

Electrical Supplies to Rural Areas

Mr. Perkins, drawing the attention of the Minister of Fuel and Power to the fact that the cut in capital investment on the distribution of electricity supply had resulted in the serious curtailment of electricity schemes of development in rural areas, asked whether he would consider restoring a part of this capital investment in order to relieve hardship to farmers and others in these areas.

Mr. Philip Noel-Baker, in his reply, said that he was aware that the restrictions on capital investment had prevented the extension of rural supplies as fast as the area boards and their prospective consumers would like. He assured Mr. Perkins and the House that the bringing of supplies to the more remote rural populations is only one of the many forms of capital investment which would be increased as soon as the country could afford it.

In answer to further questions, the Minister said that rural extensions were going on all the time, though not as fast as he would like. As the situation became easier the Government would do more.

Lighting Schemes

The Minister of Transport was asked by Air-Commodore Harvey whether he was satisfied that road-lighting schemes affecting his department were examined with the least possible delay, and in view of the fact that they are drawn up by technical, well-qualified officers of local authorities, why he considered it necessary to examine these schemes in detail.

Mr. Barnes replied that he was satisfied that having regard to the large number of schemes put forward, they were dealt with reasonably quickly. Trunk lighting schemes, to which contributions are made from the Road Fund, have to be examined in some details.

Air-Commodore Harvey, referring to long-standing applications from East Cheshire, suggested that the Minister consider appointing a lighting officer at his regional offices to avoid "bottle-necks" in his own Ministry.

Mr. Noel Baker did not agree with this suggestion and expressed the hope that the new procedure adopted would speed up matters which come directly under local authorities.

Suppressors for Vehicles

Replying to Mr. Hewitson, Mr. Ness Edwards stated that all Post Office vehicles had been fitted with radio interference suppressors and that he was pursuing the matter with other government departments. He understood that most of them had arranged for their vehicles to be suitably equipped.

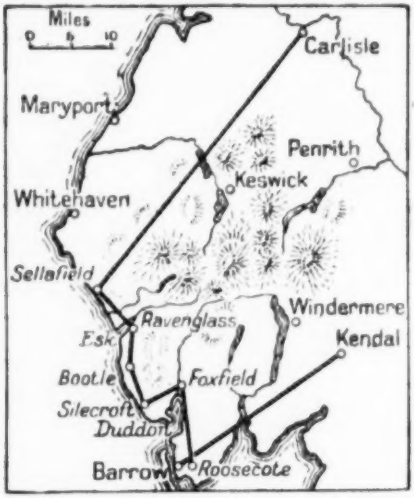
Television Transmitter in Cardiff

Mrs. Rees asked the Postmaster-General if he would indicate when the B.B.C. were to start work on the Cardiff site for the television transmitter. Mr. Ness Edwards replied that the Corporation were now negotiating for the purchase of a site at Cardiff and they expected that construction would begin by the end of the year. The transmitters had already been ordered.

Electric Supply News

Cumberland

Proposals to add another link to the grid by completing a supply line up the West Cumberland coast have been drawn up by the B.E.A. There is already one spur line from Kendal to Barrow-in-Furness, with another southward from Carlisle to Sellafield. It is now intended to run a 132 kV line between Barrow and Sellafield round the coastal fringe of the Lake District. As this line must go up the south-west Cumberland coast and across the mouths of the rivers Duddon and Esk, siting has been difficult, and the B.E.A. has met some of the objections made to the first proposals. Running northwards from Roosecote by the side of the



Duddon channel to Foxfield, the cable is to be carried over the Duddon about 150 yd upstream from the railway viaduct. The B.E.A. has agreed that, rather than take the pylons thence over the high fells, the line will run along the coast after an initial cut through the Whichan valley to Silecroft. A particularly difficult point was at Ravenglass, and the crossing of the River Esk, where even careful siting could not prevent some injury, but the planning committee has agreed that the crossing at the proposed point will interfere less with amenity than would any alternative. Our map shows the area concerned.

Saltcoats

The Town Council has been informed by the South West Scotland Electricity Board that contributions payable towards the cost of providing electricity to houses will be £15 per house if the houses are non-electric. If the Council was prepared to install electric cookers the contribution would be reduced to £3 per house.

Staythorpe

Tests of the second 60 MW generator having been successful, the machine has now been put on commercial load, we understand.

Sunderland

Preparations are well advanced for the autumn illuminations at Roker and Seaburn. Displays will be on a larger scale

Tenants of some of the Corporation's "all electric" houses were unable to meet their electricity bills and in some cases had had the equipment removed. This was reported as a meeting of the Town Council and was referred to the consumers' consultative council.

Thingoe

The R.D.C. have been informed that the Eastern Board is prepared to give an almost immediate supply of electricity to Shepherd's Grove aerodrome.

Worsley

The U.D.C. has decided that Council houses on their Hill Top, Little Hulton, site shall be all-electric.

LIGHTING SCHEMES

Sutton-in-Ashfield.—The U.D.C. has been informed by the East Midlands Electricity Board that a start would soon be made on the provision of high-intensity lighting in Outram Street, Portland Square and Priestic Road.

Urmston.—The Council is proceeding with plans to convert all gas street lamps to electricity. During last year 223 were changed over.

Usk.—The U.D.C. is to discuss with the Ministry of Transport the proposal to convert street lighting from gas to electricity.

Wakefield.—The Street Lighting Superintendent is to obtain quotations for the installation of street lighting in the Bull Ring, at an estimated cost of £1,240. He is also to prepare a scheme for lighting Providence Street, Borough Road and Union Street.

Wendover.—Street lighting in the main roads is to be improved by installing 100W lamps in place of the 60W lamps at present in operation. The council has made a precept of £500 for this purpose.

West Bridgford.—The new street lighting along a mile and a half of road from Trent Bridge to Melton Road was officially switched on last week. Sodium discharge lamps, each 140-watt, mounted 100-120 ft distant on 25 ft concrete standards, have replaced 48 gas lamps.

West Hartlepool.—Unwilling to meet a proposed 59% increase in the cost of gas supplied for street lighting, the Corporation may consider purchasing the lighting system from the Northern Gas Board, for replacement by electricity. Present annual cost of street lighting by gas is £4,856. Under the proposed increase the annual cost would be £7,700 to light 1,052 lamps.

Company Activities

Dubilier Condenser (1925)

Trading profit to March 31, 1950, £151,401 (*£130,466*), less directors' emoluments £22,790 (*£21,556*), audit fees £998 (*same*), patent additions and renewals £1,159 (*£1,210*), depreciation and amortisation £14,894 (*£14,452*), loss on fixed assets £1,553 (*£781*), tax £45,813 (*£47,883*), leaving £64,194 (*£43,586*). To Preference dividend £5,500 (*same*), Ordinary dividend 20% £8,467 (*same*), general reserve £50,898 (*nil*), forward £82,620 (*£83,291*).

Lancashire Dynamo and Crypto Ltd

Consent of the Capital Issues Committee and the Council of the Stock Exchange is sought to the issue of 83,476 Ordinary shares at £1 each to be offered to the existing holders of Ordinary stock or shares at the prices of 80s. per share.

Oriental Telephone and Electric

Consolidated trading profit of holding company for 1949, after deducting £26,665 (*£20,660*) in respect of provision for depreciation and obsolescence, is £93,326 (*£94,167*), plus dividends and interest £48,077 (*£28,080*), fees, etc. £33 (*£43*), making £141,436 (*£122,290*). To salaries, depreciation, directors' remuneration, pensions, etc., less proportion charged to branch £12,613 (*£13,505*), taxation £47,122 (*£52,418*), leaving balance of £81,701 (*£56,367*). To Ordinary dividends £50,177 (*same*), contingencies reserve £10,000 (*£5,000*), taxation equalisation reserve £14,402 (*nil*), leaving carried forward by Oriental Telephone £74,121 (*£73,740*), and subsidiary £9,858 (*£3,117*).

Parmiter Hope and Sugden

Dividend 25% for year ended March 31, 1950, on £102,049 Ordinary as increased by 90% capital bonus issue. For previous year existing £53,710 Ordinary received 30% dividend accompanied by jubilee bonus 20%. Net profit, after taxation, £59,276 (*£53,175*). Taxation £60,876 (*£60,701*); £3,437 (*£3,021*) is required for depreciation and £9,525 (*£8,936*) for emoluments. Staff and directors' superannuation scheme £3,036 (*nil*) and general reserve £43,339 (*£35,000*). Dividend takes £14,032 (*£14,770 for 30% dividend and 20% jubilee bonus*), leaving £63,477 (*£62,412*) forward.

Pirelli General Cable Works

After allowance for depreciation, net profit to March 31 is £1,291,290 (*£1,031,469*), less taxation £714,398 (*£641,256*), reserve for tax deferred by initial allowances £13,650 (*nil*). To general reserve £250,000 (*£219,227*), dividend 8% and bonus 12%, making 20% (*same*), forward £639,508 (*£436,266*).

Pye

Consolidated trading profits to March 31 £494,693 (*£312,781*), plus investment income £2,400 (*same*). To depreciation £34,599 (*£19,128*), provision amortisation leases £2,865 (*£2,440*), auditors' remuneration £2,429 (*£1,819*), directors' remuneration £26,176 (*£23,070*), cost patent rights in course acquisition £2,550 (*nil*), discount on and expenses ten-year notes issue £13,958 (*nil*), interest on ten-year notes, gross, £13,657 (*nil*), leaving £400,859 (*£268,724*), plus profit earned previously, net, £1,929 (*nil*), previous years' provision no longer required £2,440 (*£22,916*), proportion losses in subsidiaries recovered from outside holders' interests—less £110 (*£68*) profits attributable to outside holders—£1,690 (*£3,595*), making £406,918 (*£295,235*). To income tax £180,496 (*£122,830*), profits tax £61,340 (*£40,794*), credit excess provisions past years £12,767 (*nil*), leaving £177,849 (*£131,611*). To provision subsidiary not consolidated £6,000 (*nil*), staff pension subsidiary £300 (*nil*), general reserves for bad debt in subsidiaries £1,148 (*nil*), formation expenses subsidiary and associated companies £1,102 (*nil*), leaving £169,299 (*£131,611*). To Preferred Ordinary dividend £8,250 (*same*), Deferred Ordinary dividend 35% (*25%*) £41,593 (*£29,710*)—less £11,884 (*nil*) payable from Deferred Ordinary dividend reserve—Deferred Ordinary dividend reserve £16,000 (*same*), distribution to employees £24,000 (*£16,000*), forward: parent company £172,739 (*£122,821*), subsidiaries £220,302 (*£178,880*).

Scottish Cables

Trading profit for the year ended April 30 was £273,901 (*£254,060*), auditor's remuneration £356 (*£253*), provision for depreciation £24,150 (*£23,900*), directors' fees and emoluments £20,945 (*£20,080*). Taxation: profits tax £40,350, income tax for 1951-52 £93,250, and income tax for initial allowances £440, accounted for £134,040 (*£125,085*), leaving £115,355 (*£104,822*); add balance brought forward from 1949 £17,575, making £132,930 for appropriation. Dividends, 4½% preferences shares less income tax, £4,950 (*same*), Ordinary stock interim dividend of 10% less income tax, £13,750, final dividend of 20% less income tax, £27,500, making £41,250 (*same*), allocation to general reserve £65,000 (*£76,058*), leaving £21,730 to be carried forward.

Veritys

Trading profit for 1949 £20,674 (*£42,337*). Deduct depreciation £11,003 (*£12,080*), taxation £5,635 (*£16,568*), leaving net profit £4,036 (*£13,689*). Add £16,933 (*£13,194*) from last year, together with £1,500 taxation not required, making an available balance of £22,469 (*£26,883*). To dividend for year 2½% £2,475 net (*previously 5% £4,950 net*), general reserve £5,000 (*same*), carried forward £14,994.

Dividends Declared

Mather and Platt Ltd. Interim on Ordinary stock of 4% actual, payable on September 1.

Richardsons Westgarth and Co., dividend of 12% (*10%*). Net profit, after charging taxation of £283,150 (*£281,050*), was £279,438 (*£169,303*).

Commercial Information

CONTRACTS OPEN

HOME

July 28.—Macclesfield T.C. (a) Supply and erection of 12 pre-cast concrete columns and the installation of lighting equipment including 140 watt sodium vapour discharge lamps and lanterns; (b) supply and erection of 29 tubular steel columns and installation of lighting equipment including 3/80 watt fluorescent lamps and lanterns. J. H. Dossett, Borough Engineer, Town Hall, Macclesfield. Deposit £2 2s. (See our July 13 issue.)

July 28.—Manchester T.C. Electrical installation at 10 shops, maisonettes and garages at Woodhouse Park, south-west sub-centre, Portway, Wythenshawe, and 10 shops, maisonettes and garages at the south-east sub-centre, Portway. City Architect, Town Hall, Manchester. Deposit £1 1s. (See our July 20 issue.)

July 29.—Lancs C.C. Electrical installation in 38 police houses at Stretford. County Architect, County Offices, Preston.

July 31.—Romford T.C. Electrical installation for public convenience at Eastern Road. Borough Engineer, Town Hall, Romford. Deposit £2 2s.

July 31.—Thame U.D.C. Two electrically driven vertical spindle borehole type pumps, with ancillary equipment. Engineers: John Taylor and Sons, Artillery House, Artillery Row, Westminster, S.W.1.

Aug. 1.—Bentley-with-Arksey U.D.C. Supply and installation of sodium discharge lighting centrally suspended over road A19 between Don Bridge and Magnet Hotel, by erection of either new span wires or bracket arms. Engineer to the Council, R. N. Penlington, Council Offices, Cooke Street, Bentley, near Doncaster. Deposit £2 2s. (See our July 6 issue.)

Aug. 1.—Dundee T.C. Two electrically driven centrifugal pumps to deliver 250 g.p.m. at 180 ft. total head, coupled to slip ring induction motors of 400-440 V, 3 phase, 50 c/s, complete with ancillary equipment for Clatto pumping station. G. Little, Engineer and Manager, Dundee Corporation Waterworks, 17 City Square, Dundee.

Aug. 1.—Southampton T.C. Electrical installations to 40 houses and 96 flats to be erected on Kingsland housing site. Borough Architect, Civic Centre, Southampton. Deposit £5. Advertised in this issue.

Aug. 1.—Stoke-on-Trent T.C. Year's supply of electric lamps. City Surveyor, Town Hall, Stoke-on-Trent.

Aug. 4.—Bridgnorth T.C. Supply and fitting of electric lighting and power installations in 53 pre-war council houses. Council's Consulting Engineer A. J. B. Pashler, Birmingham. Tender form from Borough Surveyor, College House, Bridgnorth. Deposit £2 2s.

Aug. 4.—Sunderland. Electrical installation work for adaptation and extension of Bede Tower, Ryhope Road. Borough Architect, Grange House, Stockton Road, Sunderland. Deposit £2 2s.

Aug. 5.—Scunthorpe T.C. Supply and erection of (a) 60 reinforced concrete street lighting columns, (b) 60 enclosed lanterns with 140-W sodium vapour discharge lamps, (c) supply laying and jointing of 5,000 yd. of underground cables with switchgear. Cyril Cooper, Borough Engineer, Comforts Ave., Scunthorpe.

Aug. 10.—Nuneaton T.C. Supply erection and wiring of 10 pre-cast reinforced concrete lamp columns on Ramsden Avenue site. Borough Surveyor, Council House, Nuneaton. Deposit £2 2s.

Aug. 12.—Southport T.C. Supply and erection of five sets of electrically driven (automatically operated) axial flow pumps of a total capacity of 31,250 gallons per minute. Borough Engineer, Town Hall, Southport. Deposit £2 2s.

Aug. 18.—Belfast. Two vertical axial flow circulating water channel pumps to pump 24,000 g.p.m. at a head of approx. 13 ft. also crane and channel pump-house equipment for Harbour power station. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-on-Tyne 1. Deposit £5 5s. (See our July 13 issue.)

Aug. 21.—Ilkley U.D.C. Installation of mercury vapour lighting (42 columns) on trunk road A.65, at Burley in Wharfedale. Surveyor, Town Hall, Ilkley. Advertised in this issue.

Aug. 21.—St. Albans R.D.C. Provision and erection of 53 reinforced concrete columns, brackets and lanterns with 140-W sodium discharge or 250-W mercury lamps in High St., London Colney. Engineer and Surveyor, 43 Upper Lattimore Rd., St. Albans. Deposit £2 2s. Advertised in this issue.

Aug. 30.—Dublin. (a) Two (or three) 6-ton electric portal wharf cranes, and (b) two 10-ton electrical portal wharf cranes for Dublin Harbour. Engineer's office, Dublin Port and Docks Board, East Wall Road, Dublin. Deposit £5.

Sept. 1.—Belfast T.C. 33 kV main cables, auxiliary cables, and accessories for stage 1 of the 33 kV distribution system extensions. Merz and McLellan, consulting engineers, Carliol House, Newcastle-upon-Tyne 1. Deposit £5 5s. Advertised in this issue.

No date stated.—Gateshead T.C. Electrical installation at Gateshead new technical college. (Names to be submitted by August 3). H. J. Cook, Chief Architect, Swinburne Street, Gateshead. Advertised in this issue.

No date stated.—Swansea T.C. Electrical installation at New Cockett modern secondary school. Borough Architect, Guildhall, Swansea. (Applications by August 5). Deposit £2. (See our July 20 issue.)

No date stated.—Stanhope Parish Council. Maintenance of metal filament street lighting lamps. N. Brown, Westville, Wearhead.

No date stated.—Dublin. Electrical installation at Nurses Home, Leopardstown Park Hospital. Office of Public Works, Dublin. Deposit £1.

No date stated.—Chester-le-Street R.D.C.—Electrical installation in 46 houses on Lumley site, 36 houses at Ouston and 92 at Barley Mow. F. Bowman, housing architect, estate office, Birtley, Co. Durham.

No date stated.—E. Preston. Electrical installation at Grange county primary school. Borough Engineer and Surveyor, Municipal Building, Preston.

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Aug. 2.—Damascus. P.V.C. sheathed cables, jumper wire, and distribution boxes. Director-General of the Syrian Posts, Telephones and Telegraphs Dept. of the Ministry of Communications, Damascus. B.o.T. (Ref. CRE (IB) 58810/50).*

Aug. 4.—Karachi. Lead-covered cable to B.S.S. 7 required at Lahore, Dacca and Rawalpindi. Director-General of Supply and Development, Frere Road, Karachi. B.o.T. (Ref. CRE (IB) 59266/50).*

Aug. 5.—Cape Town. E.H.T. switchgear, tripping battery equipment, reactors, e.h.t. and l.t. cable and boxes, welder, h.d.b.c. wire, etc., for a new main distribution substation; secondary substations and general distribution extensions. Electricity Dept., Municipality of Worcester, South Africa. B.o.T. (Ref. CRE (IB) 58125/50).*

Aug. 9.—Uruguay. Ordinary monophase meters for 220 V 2,000 meters of 15 amp; direct 3-phase meters of 2 systems wattmeters for 220 V; 2,000 meters of 3 × 10 A, 1,500 meters of 3 × 25 A, 500 meters of 3 × 50 A, 250 meters of 3 × 75 A, 150 meters of 3 × 100 A. Three-phase high precision meters of 2 systems wattmeters with 2 constant current transformers: 50 meters of 200/5 A, 50 meters of 300/4 A, 30 meters of 500/5 A, 30 meters of 750/5 A, 40 meters of 1,000/2,000/5 A. Spare parts. Usinas Electricas y Telefonos del Estado, Montevideo. B.o.T. (Ref. CRE (IB) 57616/50).*

Aug. 10.—Buenos Aires. Electrical equipment and transmission cables for control of sluice gates at "Los Quiroga" dam in the province of Santiago del Estero. Director General of Water and Electric Power, Buenos Aires, Argentina.

Aug. 10.—Mysore. Two 110/4·6-13·8/33-66 kV, three winding transformers, rating 6,000 kVA with lightning arresters on the transformer. One 33 kV star/115 V star, 115 V delta, 500 VA with limiting resistance and fusible disconnectors. B.o.T. (Ref. CRE (IB) 57694/50).*

Aug. 16.—Madras. Four 300 kVA single-phase, 25 c/s, oil-immersed, self-cooled, cone-type, double-wound transformers. Stores Purchase Committee, Government of Mysore, Bangalore. B.o.T. (Ref. CRE (IB) 58649/50).*

Aug. 17.—Brisbane. Ten-inch disc type insulators and insulator iron work for use on the 110 kV and 33 kV o.h. transmission lines of a 3-phase, 50 c/s system Secretary, City Electric Light Co., Brisbane. B.o.T. (Ref. CRE (IB) 59150/50).*

Aug. 22.—Buenos Aires. Ten diesel electric generating sets of 25, 50, 75 and 100 kW d.c. Tender No. 263/50. Director General of Water and Electric Power, Buenos Aires, Argentina.

Aug. 24.—Auckland. Supply and installation of electrically driven pumping plant and pipe specials for Mount Hobson pumping station. Stores Purchasing Officer, Town Hall, Auckland. Deposit £2.

Aug. 24.—Brisbane. 44 kV, 3-phase, 50 c/s automatic out-door type switchgear: 6 800A oil circuit-breakers of 750 MVA-rupturing capacity for the control of alternators; 5 similar for station transformers, 6 for station interconnectors; 8 for feeders; and spares for all equipment. City Electric Light Co., Brisbane. B.o.T. (Ref. CRE (IB) 59152/50).*

Aug. 29.—Pakistan. Supply of 6 and 12 V batteries, secondary, portable. War Office and suitable commercial types. Commercial Secretary, Supply and Stores Department, 40 Lowndes Square, S.W.1. Reference SD 6869/G.S., fee 5s. Advertised in this issue.

Aug. 31.—Brisbane. 6,600 V and 415 V, 3-phase, 50 c/s metal-clad single busbar, indoor switchgear. City Electric Light Co., Brisbane. B.o.T. (Ref. CRE (IB) 59116/50).*

Aug. 31.—Johannesburg. Thirteen vertical boring and turning mills, electrically driven for S. African Railways. (Tender No. G.1307). Chief Stores Superintendent, Room 405, Park Chambers, Rissik Street, Johannesburg.

Sept. 7.—Brisbane. Supply of 33 kV impregnated, paper-insulated, metallic screened, lead covered cables and pilot cables. City Electric Light Co. Ltd., Boundary St., Brisbane. B.o.T. (Ref. CRE (IB) 59151/50).*

Your Queries — Answered

"Johnson" floor polishers, makers of? T.E.—S. C. Johnson and Son Ltd., West Drayton, Middx. (18470)

Sealing compound for transformer oil tanks, makers of? P.M.—We have advised this inquirer to contact the B. B. Chemical Co. Ltd. of Ulverscroft Rd., Leicester. (18473)

Drink mixers—small, makers of? A.J.—G.E.C. Ltd., Magnet House, Kingsway, W.C.2; Nelco Ltd., Station Rd., Shalford, Surrey; S. Guiterman and Co. Ltd., 37 Soho Sq., London W.1; Michell and Cooper, 8 Hill St., London S.E.15; Gaskell and Chambers (London) Ltd., 109-115 Blackfriars Rd., London S.E.1. (18478)

"Robrad" lampholders, makers of? H.C.—Robbins and Bradley, 7-10 Tennant St., Birmingham. (18482)

"Flamguard" safety guards, makers of? E.B.—Flamguard Co., Lotus Works, Heigham Rd., London E.6. (18487)

Mixer with potato scraper, attachment, makers of? N.E.—Selyac Precision Eng. Co. Ltd., Forde Rd., Newton Abbot, Devon. (18490)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWERS WANTED

"Limpet type" externally fixing thermostats, makers of? M.A. (18492)

"Wirres" table griller, makers of? L.C. (18497)

Sept. 7.—Johannesburg. Three electrically driven axle box milling machines for S. African Railways. (Tender No. G.1469). Chief Stores Superintendent, Room 405, Park Chambers, Rissik St., Johannesburg.

Sept. 8.—Johannesburg. Supply and delivery of one 50 kVA, 3-phase power transformer, outdoor pole-mounted type and two 250 kVA, 3-phase power transformers, indoor type, all suitable for 11,000/400/231 V; extension to the electrical network including all material and labour, laying cables and providing switchboards, etc. D. J. K. Marais, Natald House, 14 Plein Street, Johannesburg.

Sept. 14.—Wellington. 736 suspension strings of e.h.t. insulators, each string comprising 8 units 5 in. by 10 in., 10,000 lb. M. and E. rating, 1 hook for attachment, 1 socket eye for attachment to cable clamp and 162 strain clamps. B.S.S. 137/1941 refers. Stores Manager, New Zealand State H.E. Commission, Wellington.

Sept. 25.—Wellington. Three 11·1 kV automatic voltage regulators, 50 c/s, for electricity dept. (Contract No. 581). Electricity House, Cuba Street, Wellington.

Sept. 28.—Johannesburg. One 12¼ in. centre lathe (Tender No. G.1532) and seven capstan lathes (Tender No. G.1483), all electrically driven with geared headstock for S. African Railways. Chief Stores Superintendent, Room 405, Park Chambers, Rissik St., Johannesburg.

Sept. 29.—Wellington. Two electric motor-driven sewage pumps and fittings for station No. 18. Motors must comply with B.S.S. No. 168 of 1936. Town Clerk, Wellington City Council. Deposit £25; bond £50.

Oct. 3.—Tangier. Two generating sets of 2,500 kW at Mogoga station for Regie des Services de l' Eau et de l' Electricite. Direction de la Regie, Rue Vermeer, Tangier.

Oct. 5.—Johannesburg. Two cold sawing machines, each electric-motor driven, for S. African Railways. (Tender No. G. 1488). Chief Stores Superintendent, Room 405, Park Chambers, Rissik St., Johannesburg.

Oct. 6.—Pretoria. One hundred 10 kVA, single-phase, 11,000/250 voltage ratio; ten 15 kVA, treble-phase, 11,000/433; ten 25 kVA, treble-phase, 11,000/433; and ten 50 kVA, treble-phase, 11,000/433 voltage ratio for Stores Department, City Council of Pretoria. Town Clerk, City Hall, Paul Kruger Street, Pretoria.

Oct. 17. Bloemfontein. Two stoke-fired boiler units and other plant for extensions to No. 2 power station. Tender No. L.847. Merz and McLellan, 32 Victoria Street, S.W.1.

Oct. 25. — Queensland. One water tube boiler (Specification No. 224). Secretary, State Electricity Commission, Scottish Union House, Eagle St., Brisbane, Australia. B.o.T. (Ref. C.R.E. (IB) 59114/50).*

Nov. 1.—Salisbury. Two water-tube boilers, superheater, economiser, air heater, mechanical stoker, draught apparatus, steam and feed piping, foundations, structural steel work, hoppers, gangways, ladders, instruments and accessories etc., for Umniati "B" generation station. Contract No. 74/1950. Secretary, Electricity Supply Commission of Southern Rhodesia, P.O. Box 377, Salisbury. B.o.T. (Ref. C.R.E. (IB) 59295/50).*

PRICES OF CABLE METALS AND OTHER MATERIALS

(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	186 0 0	£180 0 0
Delivered in 2nd and 3rd month after order	187 10 0	—
Delivered in 4th, 5th and 6th month after order	189 0 0	—
LEAD, good soft pig (foreign)	96 0 0	96 0 0
" "English" quality	97 10 0	—
Delivered in 2nd and 3rd month after order, plus	1 0 0	—
TIN (99·99·75 %) (Cash)	715-716	—
" (3 months)	715½-716	—
ALUMINIUM, commercial purity (del.)	112 0 0	—
ZINC	127 10 0	120 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.)	43 5 0	—
Mild Steel Tape (0.04 in.)	26 0 0	—

CONTRACTS PLACED

Berwick-on-Tweed T.C. Internal wiring of 300 pre-war council houses. Rodel Electrical Co. Ltd.

Folkestone T.C. Electrical installation of 68 houses at Biggins Wood housing site. H. G. Cockram. £2,070.

L.C.C. Installation of electricity in 268 flats in Duke's Court, York Street Dwellings, Westminster and Shelton Street Dwellings, Holborn. Arthur Scull and Son Ltd.

Luton T.C. Electrical installation at Farley county primary school. Iverson Electrical Co. £3,648.

Plymouth T.C. Electrical installation at Ernesettle primary school No. 1. Drake and Gorham Ltd. £2,440.

Wakefield T.C. Installation of electric lighting, power and clocks at Flanshaw county junior school and Broadway county infants school. H. Smith. £1,996 18s., £1,508 12s.

Wallasey T.C. Electrical installation at Somerville secondary modern school. Pary's Electrical Engineers Ltd., £4,571 10s. (recommended).

TRADE NOTES

Annual Holidays.—Works and offices of William McGeoch and Co., Ltd., Birmingham, will be closed for the annual summer holiday from July 28 until August 9. A skeleton staff will deal with urgent matters.

Cable Prices.—The lead price, "English" quality, was incorrectly given in our metal price table last week. It should have read £97 10s. The price of galvanised steel wire should have been £43 5s.

Distributor appointed.—International General Electric Co. Inc. has appointed Palestine Economic Corporation as distributor of general products in Israel.

New Address.—Address of Mr. J. H. Grierson, Northern representative for the Power Centre Co., Ltd., is now 68a Allerton Rd., Mossley Hill, Liverpool 18. Tel.: Sefton Park 4826.

New Offices.—Recently appointed sales director of Tuscan Engineering Co., Ltd., Commander C. F. Nock has just opened a sales office at 447 Grand Buildings, Trafalgar Square, London, W.C.2, to handle special estimates for electric motors.

William McGeoch and Co., Ltd., of Warwick Works, Birmingham, 10, have now opened an office at Bath for the South Western Area. The address is, c/o Messrs. Western Industrial Agencies (Bath), Ltd., 11 Railway Street, Bath. Telephone number, Bath 60416.

BUSINESS PROSPECTS

HOME

Berwickshire C.C. Erection of 82 houses. R. Martin, County Clerk, County Buildings, Duns.

Cardiff T.C. Erection of 58 bungalows. City Surveyor, City Hall, Cardiff.

Crewe T.C. Recommended to approve provision of public lighting at Pym's Lane, Minshull New Rd., Middlewich St. Estate, Hillside Drive and Jubilee Avenue areas. Estimated cost £4,788.

Dagenham T.C. Highways committee reports that authority for the execution of the following street lighting works has been received from the Ministry of Transport: (1) Green Lane—42 lamps. (2) Whalebone Lane South—20 lamps. (3) Chequers Lane—13 lamps, and (4) Station Road—13 lamps. Estimated cost of the work is £8,150, and the Ministry of Transport have recommended the Ministry of Health to issue consent to the necessary loan.

Dewsbury T.C. Housing and town planning committee approved schemes submitted by street lighting superintendent for provision of electric street lamps for schemes 1 and 2 on the Chickenley Housing Estate at costs of £300 and £480 respectively.

Lancs. C.C. Erection of 6 nursery schools and Rainhill C.E. school. G. Noel Hill, County Architect, County Officer, Preston.

Leamington Spa T.C. Recommended by Highways committee approve schemes for fluorescent lighting at Kenilworth Road (Clarendon Avenue to Borough Boundary), 30 columns with three-tube lanterns, approximate cost £2,325; Tachbrook Road (High Street to Borough Boundary) 35 columns with two-tube lanterns, £2,420; and High Street (Bath Street to Tachbrook Road) two columns with three-tube lanterns, £168.

North Riding C.C. To convert Easingwold and Falsgrave old police stations into housing accommodation. County Architect, County Hall, Northallerton.

Oldbury. Erection of 20 houses in Barnford Crescent, Causeway Green Estate, Langley. Borough Engineer and Surveyor, Municipal Bank Chambers, Oldbury.

Osgoldcross R.D.C. Erection of 38 houses at Byram Park, Brotherton, near Leeds. J. W. Bland, Clerk of the County.

Reading E.C. Considering installation of electric lighting throughout St. John's C.E. School.

Saddleworth U.D.C. Erection of 42 houses at Greenfield and Dobcross. Howard and Benson, Architects, 88 Mosley St., Manchester.

Scarborough T.C. To build 8 houses and flats at Longwestgate, 4 houses and shops at Eastfield and 24 houses and flats at Manham Hill, Eastfield. Borough Engineer, H. V. Overfield.

Scunthorpe. Erection of technical college buildings at Kingsway, Scunthorpe. A. Ronald Clark, County Architect, County Offices, Lincoln.

Sittingbourne and Milton U.D.C. Erection of 6 blocks of flats on Canterbury Rd. site. Engineer and Surveyor's Office, Sittingbourne.

Wakefield T.C. To install street lighting in the Bull Ring, estimated cost £1,240, and prepare an additional scheme for lighting of Providence St., Borough Rd., and Union St.

Whitefield U.D.C. Erection of 20 flats and 10 houses on Elms Estate, Scheme No. 5. Surveyor and Architect, Town Hall, Wakefield.

OVERSEAS

Belgian Congo. Entrelco, S.C.R.L., Boite Postal 3015, Leopoldville-Kalina, seeks purchase quotations for electric motors up to 50 h.p., 50 c/s, 380 V; starters and accessories for these motors; high and low-voltage cable and accessory equipment; disconnect switches, oil circuit breakers, transformers, insulators and structural parts for high-voltage sub-stations up to 1,000 kVA and incandescent and fluorescent lighting fixtures.

Belgium. Ateliers de Construction Electriques d'Anvers, ACEA, 144 Rue Tweemont, Deurne-Antwerp, requires purchase quotations for small single-phase electric motors and parts for such motors.

Canada. Gordon Russell Ltd., 744 West Hastings Street, Vancouver, British Columbia, are anxious to receive quotations for two mining type transformers. One to be a transportable standard mining type transformer 150 kVA, 3 phase, 60 cycle, 2,200/220/440 volts delta-star with neutral point earthed, to B.S. Spec. No. 355, 1939, for use on 36 in. rail-gauge track, and another with addition of H.V. adaptor chamber fitted with high voltage oil-immersed circuit-breaker having overload protective equipment and providing earth-leakage protection through a ring-leakage-transformer on the medium voltage side.

Canada. John Herring and Co., 107 Front Street East, Toronto, Ontario, are anxious to find a source of supply in the U.K. of electric lamps for industrial purposes. The lamps should be 100 W or 150 W and should be 110-115 V, standard American screw base, American market dimensions, long life 3,000-5,000 hours.

Liberia.—Mr. J. D. MacRae, Commercial Adviser to the Liberian Government, has received local enquiries for supplies of lightning conductors for houses or buildings, and restaurant or cafe equipment, such as percolators. Interested U.K. firms should send catalogues, prices, etc., to Mr. J. D. MacRae, Office of the Commercial Adviser, Department of Agriculture and Commerce, Monrovia, Republic of Liberia.

Persia.—Abolhassan Dibo and Co., of Khiaban Hafez, Tehran, Persia, desire to receive from U.K. manufacturers details of hydraulic turbine generators: output 160-200 kW.

Syria. Societe Syrienne de Filatures and Tissage, P.O.B. 14, Aleppo, would like purchase quotations for two Diesel engine generator sets from 500 to 1,000 kW, and two Diesel engine generator sets from 1,000 to 1,500 kW. Construction and Entreprises Industrielles (Moussalli and Co.), P.O.B. 193, Aleppo, seeks agency for Diesel engines, horizontal and vertical types, up to 150 h.p. and Diesel engine generator sets, 3,500 kW, slow-speed.

U.S.A.—A. E. Middleman, 7 West 46th Street, New York 20, N.Y., desire to obtain the names of U.K. manufacturers able to supply $\frac{1}{2}$ watt carbon resistors 150, 200 and 1,800 ohm.

U.S.A. Mr. Hubert Guyod, president of the Well Instrument Developing Co., P.O. Box 2406, Houston, Texas, is keen to buy electrical resistors for use in machines they are manufacturing for use by oil companies. Quotations should be in dollars, f.o.b. or c.i.f. It is important that time of deliveries be stated

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Voluntary Liquidation

Miller-Hepworth Ltd., fluorescent lighting engineers and dealers in fluorescent fittings, High Lee Works, Lee Street, Oldham. At a recent meeting of creditors a statement of affairs showed liabilities amounting to £17,128. Assets were estimated to produce £3,218 and after allowing £366 for preferential claims, there were net assets of £2,852, or a deficiency as regarded creditors of £14,275. The issued capital of the company amounted to £8,600 and, so far as the contributories were concerned, there was a total deficiency of £22,875.

Incorporated on April 2, 1946, the company acquired an existing business for a consideration of £1,731 in cash. Trading figures showed that for the period to March 31, 1947, there was a loss incurred of £1,847, and in the following year a further loss of £585. For the year to March 31, 1949, there was a loss of £791 and the next year the loss on trading totalled £11,034. For the period April 1, 1950, to June 30 last the deficiency account disclosed a loss of £2,928.

It was resolved to confirm the voluntary liquidation of the company with Mr. James Moss of 28 Queen Street, Manchester, as liquidator. A committee of inspection was appointed.

Neon (Portsmouth) Ltd., electrical contractors, 43 St. James Street, Portsea, Hants. A recent meeting of creditors was informed that liabilities amounted to £4,055. The assets were estimated to produce £2,833 and after allowing £65 for preferential claims, there were net assets of £2,768 or a deficiency as regarded creditors of £1,287. The issued capital of the company amounted to £570 and, so far as the contributories were concerned, there was a total deficiency of £1,857.

The company was incorporated in September, 1946, with a nominal capital of £1,000 and had carried on business as electrical contractors. Trading figures showed that for the year to October 27, 1947, there was a net profit earned of £785, and in the following year a further net profit of £645. For the year to October 27, 1949, there was a net loss sustained of £663 and for the period October 28, 1949, to July 12, 1950, the net trading loss amounted to £425. The present position was attributed to decline in electrical contracting work resulting in an expensive change-over to neon contracting.

A resolution passed, confirmed the voluntary liquidation of the company with Mr. H. Pyke, of Messrs. Cartwright Pyke and Co., Portsmouth, as liquidator, together with a committee of inspection.

A. W. F. Radio Products, Ltd. Resolution for voluntary winding-up passed at meeting on July 14. Mr. E. Eastwood of A. E. Ellison and Co., Commerce House, Cheapside, Bradford, appointed liquidator.

Volta Electric, Ltd. Resolution for voluntary winding-up passed at meeting on July 10. Mr. E. D. Basden, 73 Basinghall Street, E.C.2, appointed liquidator.

W. R. Pratt (Refrigeration), Ltd. Meetings of members and creditors at offices of Singleton, Fabian and Co., 30 Southampton Buildings, Chancery Lane, W.C.2, at 11 a.m. and 11.15 a.m., respectively on August 23.

BANKRUPTCY ACTS

First Meetings

Southend. A. Jacobs, electrical engineer, of 312 London Road, Westcliff-on-Sea. First meeting on July 31 at 12.30 p.m. at 3 Central Buildings, Matthew Parker Street, Westminster, S.W.1. Public examination on September 12 at 11 a.m. at The Petty Sessions House, Alexandra Street, Southend.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Alco. 675,395. Class 9. Engine-driven battery chargers. Arthur Lyon and Co. (Engineers) Ltd., 18 Telford Way, Westway Estate, London W.3.

Hotpoint. 687,759. Class 7. Dish washing, ironing clothes, wringing, knife sharpening and potato-peeling machines, etc. 687,760. Class 9. Electric flat-irons, vacuum cleaners and polishing machines. Hotpoint Electric Appliance Co. Ltd., Crown House, Aldwych, London W.C.2.

Perolectric. 686,967. Class 11. Electrically operated heating installations and apparatus. Kestner Evaporator and Eng. Co., Ltd., 5 Grosvenor Gdns., Westminster, S.W.1.

Potrite. 688,028. Heat insulating materials. Potters' Insulations Ltd., Tameside Mills, Park Road, Dunkinfield.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Batteries and Components Ltd., 30 Lomond Grove, Camberwell, S.E.5. Elec. equipment specialists, etc. Cap.: £1,000. Dirs.: D. L. Hollands, Ivy P. Belcher, E. T. Stokes.

Manley Insulation Ltd., Hampton Road, Urmston, Lancs. Mnfrs. of and dlrs. in refrigerators and cold storage machinery, etc. Cap.: £500. Dirs.: T. Porter, J. Maguire.

Sarum Electric Ltd., 32 Chipper Lane, Salisbury, Wilts. Elec., radio, television, mech., civil and genl. engrs., etc. Cap.: £1,000. Dirs.: G. E. Sparrow and Mrs. A. Sparrow, C. A. Sparrow.

Tom Rogers Ltd., 24 Servia Road, Leeds 6. Dlr. in and repairer of elec., wireless and television goods. Cap.: £2,000. Dirs.: T. Rogers, T. Kirkbitson.

MEETINGS TO NOTE

MONDAY, AUGUST 28

SUBMARINE CABLE CENTENARY.—Exhibition opens at Science Museum, South Kensington, London.

WEDNESDAY, AUGUST 30

BRIT. ASSN.—Annual meeting. Birmingham.

TUESDAY, SEPT. 5

SCIENTIFIC INSTRUMENT MANUFACTURERS' ASSN.—Annual exhibition and symposium (until Sept. 8). Examination Hall, Queen Square, W.C.1.

WEDNESDAY, SEPT. 6

RADIO INDUSTRY COUNCIL.—Radio and television exhibition (until Sept. 16). Castle Bromwich, Birmingham.

MONDAY, SEPT. 18

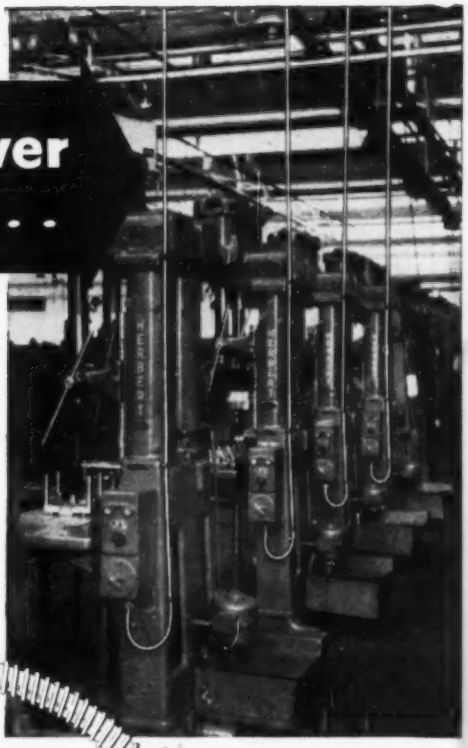
INTER. MECH. ENGRG. CONGRESS.—(Until Sept. 23). Brussels.

ASSN. PUBLIC LIGHTING ENGRG.—Annual meeting and conference (until Sept. 23). Winter Gardens, Bournemouth.

TUESDAY, SEPT. 26

SYMPOSIUM ON INFORMATION THEORY.—(Until Sept. 29). Royal Society, Burlington House, Piccadilly, W.1.

Bringing Power to the job . . . .

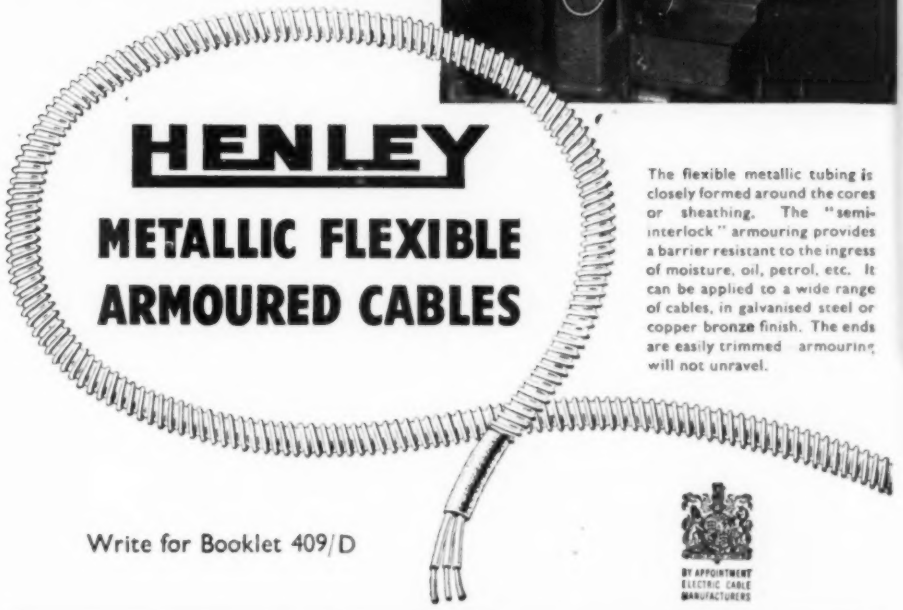


Giving flexibility plus mechanical strength, HENLEY metallic flexible armoured cables and cords meet specialised needs where current has to be carried to machine tools and engineering equipment.

HENLEY

METALLIC FLEXIBLE ARMOURED CABLES

The flexible metallic tubing is closely formed around the cores or sheathing. The "semi-interlock" armouring provides a barrier resistant to the ingress of moisture, oil, petrol, etc. It can be applied to a wide range of cables, in galvanised steel or copper bronze finish. The ends are easily trimmed armouring will not unravel.



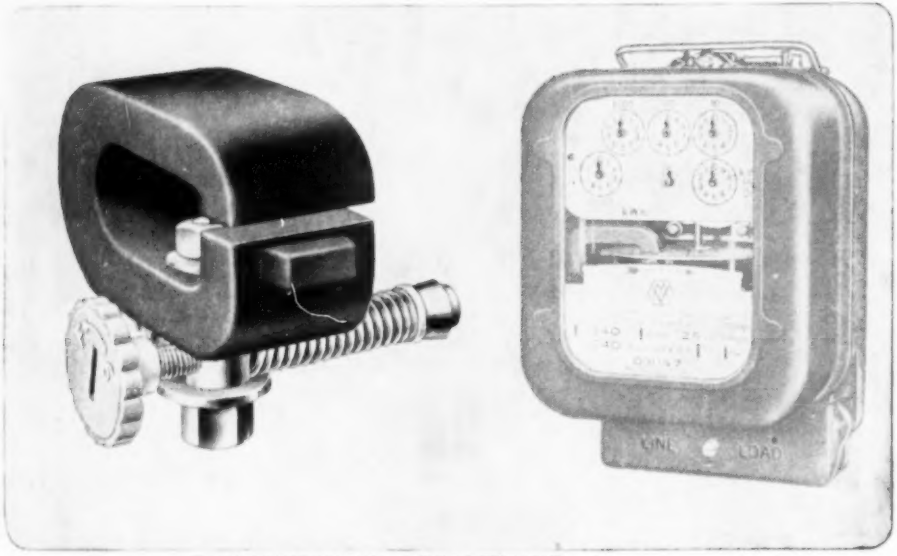
Write for Booklet 409/D

BY APPOINTMENT ELECTRIC CABLE MANUFACTURERS

W.T.HENLEY'S TELEGRAPH WORKS CO. LTD. 51-53 HATTON GARDEN, LONDON, E.C.1

Meticulous Metering

by the METROVICK TYPE NF Watt-hour Meter.



5—DAMPING SYSTEM

Always an outstanding feature of Metrovick meters the brake-magnet assembly of the NF Meter has:—
(i) high coercive force coupled with magnetic stability (ii) immunity to stray fields, (iii) easy and accurate adjustment, (iv) simple to mount and remove and (v) light in weight.
Made in "Alnico", chosen as the most suitable material for the purpose, the permanent magnet of the NF Meter is designed to reduce waste leakage flux to a minimum.
The illustration above shows the magnet with its adjusting screw.

Other advertisements in this series:—
2—CASES and COVERS; 3—PERFORMANCE; 4—REGISTERING MECHANISM; 6—RESILIENT BEARING; 7—TEMPERATURE COMPENSATION; 8—ACCESSIBILITY and TERMINALS; 9—CALIBRATION ADJUSTMENTS.

WRITE FOR A COPY OF PUBLICATION S.P. 7356/2

METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

TRAFFORD PARK, MANCHESTER 17

G/A03

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 35s. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

CITY AND COUNTY BOROUGH OF BELFAST

Electricity Department

TENDERS are invited for the supply, delivery, laying, erection and maintenance of:

33KV MAIN CABLES, AUXILIARY CABLES AND ACCESSORIES FOR STAGE I OF THE 33 KV DISTRIBUTION SYSTEM EXTENSIONS.

Form of Tender (No. N.926), in quadruplicate, conditions of contract, specification and drawings may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne, 1, on payment of a deposit of five guineas (cheque to be made payable to the Belfast Corporation Electricity Department), which deposit will be refunded provided a bona-fide tender be lodged and not withdrawn. Extra copies of the contract documents may be obtained at three guineas per set, which sum will not be returnable.

Each tender, in quadruplicate, in sealed envelope marked "Tender for Stage I 33 kV Cables, Electricity Department," and endorsed with the name and address of the firm tendering, must reach the undersigned not later than 4 p.m. on Friday, September 1, 1950.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
July 20, 1950. (F 490)

HIGH COMMISSIONER FOR PAKISTAN

THE High Commissioner for Pakistan invites tenders for the supply of 6 V and 12 V BATTERIES, secondary, portable, War Office and suitable commercial types.

Forms of tender, which are returnable by August 29, 1950, may be obtained from the Commercial Secretary, Supply and Stores Department, 40 Lowndes Square, London, S.W.1, between the hours of 10 a.m. and 4 p.m., Mondays to Fridays, on payment of a fee of five shillings (not returnable) per tender. The reference SD.6889 GS should be quoted on all applications for tender forms. (F 488)

COUNTY BOROUGH OF SOUTHAMPTON

TO ELECTRICAL CONTRACTORS

TENDERS are hereby invited for the ELECTRICAL INSTALLATIONS TO 40 HOUSES AND 96 FLATS TO BE ERECTED ON THE KINGSLAND HOUSING SITE.

Application to tender must be accompanied by a deposit of £5, or the Borough Treasurer's receipt for same, and must be addressed to, and reach, the Borough Architect not later than Tuesday, August 1, 1950.

The Form of Tender and Specification and drawings, together with supplemental conditions of contract, will be forwarded to contractors who have applied as above.

The electrical contractor will be required to enter into a sub-contract with the main contractor in accordance with the conditions of the main contract. The main contract will be the current form issued under the sanction of the Royal Institute of British Architects plus supplemental conditions and will be available for inspection at the Borough Architect's office.

Deposits will be returned on receipt of a bona fide Tender (not subsequently withdrawn), or on return of the documents.

Tenders on the form and in the official envelope provided must be addressed to the Borough Architect, and delivered not later than 10 a.m. August 31, 1950.

R. RONALD H. MEGGESON,
Town Clerk.

Civic Centre, Southampton. (F 498)

ILKLEY URBAN DISTRICT COUNCIL

STREET LIGHTING—BURLEY IN WHARFEDALE

THE Council invite tenders for the execution of the necessary work (including the supply of materials and equipment) for the installation of Mercury Vapour Lighting (42 lighting columns) on the Trunk Road (A. 65) at Burley in Wharfedale.

Specification, schedule and form of tender may be obtained from the Council's Surveyor and plans may be inspected during normal office hours.

Tenders, in plain sealed envelopes endorsed "Street Lighting—Burley in Wharfedale," must be received by the undersigned not later than August 21, 1950.

The Council do not bind themselves to accept the lowest or any tender.

BERTRAM E. TOWNEND,
Clerk of the Council.

Town Hall, Ilkley.
July 20, 1950. (F 466)

ST. ALBANS RURAL DISTRICT COUNCIL

PROPOSED ELECTRIC STREET LIGHTING, HIGH STREET, LONDON COLNEY (ROUTE A.6)

TENDERS are invited for the following works in connection with the provision of electric street lighting in High Street, London Colney, near St. Albans.

Provision and erection of No. 53 reinforced concrete columns brackets and lanterns and the installation of either 140-W sodium discharge or 250-W mercury discharge lamps, and ancillary works.

Plans, general conditions of contract and terms may be seen at the offices of, and specification and form of tender obtained from, the Engineer and Surveyor to the Council, 43 Upper Lattimore Road, St. Albans upon the payment of a deposit of £2 2 -, which will be returned on receipt of a bona fide tender not subsequently withdrawn.

Tenders, in a plain sealed envelope and endorsed "Lighting Trunk Road, A.6, London Colney," should reach the undersigned not later than 12 noon on Monday, August 21, 1950. The Council do not bind themselves to accept the lowest or any tender.

ERIC N. WHEELER,
Clerk to the Council.
(F 462)

COUNTY BOROUGH OF GATESHEAD

NEW TECHNICAL COLLEGE

THE Education Committee invite reputable electrical contractors to indicate their willingness to submit Tenders for the ELECTRICAL INSTALLATION at the above.

The work involved is of a highly technical nature, and only contractors who have had experience of similar work on very substantial contracts should apply.

Applicants are required to give particulars and approximate cost of similar installations carried out by them.

Applications should be submitted to H. J. Cook, A.R.I.B.A., M.I.Struct.E., Chief Architect, Swinburne Street, Gateshead, within seven days of this advertisement.

The selected contractors will be supplied with the plans, specifications and tender forms prepared by the Electrical Consultants, Messrs. R. W. Gregory and Partners, Newcastle.

The contract for the above work will form a sub-contract of the Main Building Contract, and the sub-contractor will be required to enter into a bond with the General Contractor and the Corporation. A copy of the general conditions of contract issued by the County Borough of Gateshead may be seen at the Chief Architect's office. The lowest or any tender will not necessarily be accepted.

J. W. PORTER,
Town Clerk.

Town Hall, Gateshead, 8.
July 21, 1950. (F 489)

APPOINTMENTS VACANT

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

North Caledonia

APPLICATIONS are invited for the post of FIRST ASSISTANT DISTRICT ENGINEER at Elgin. Applicants should have a sound technical knowledge and hold the Higher National Certificate or equivalent. Experience in the operation and maintenance of h.t. and l.t. distribution systems essential. The salary will be in accordance with the National Joint Board Schedule, Class "E," Grade 5, namely, £692 per annum. Superannuation scheme applicable. If essential, a bungalow is to be made available on a service tenancy, subject to the necessary building permits being obtained.—Applications to be forwarded to the undersigned within seven days after the appearance of this advertisement.

A. CLERK,
Area Manager.

West Villa, South Street, Elgin. (F 445)

BRITISH ELECTRICITY AUTHORITY

South Western Division

SHIFT CHARGE ENGINEER—PORTISHEAD GENERATING STATION

APPLICATIONS are invited for the position of Shift Charge Engineer at Portishead Generating Station. Salary and conditions in accordance with the N.J.B. Schedule, Class "J," Grade 7, £736-£770 per annum.

Applicants should have good technical experience, a sound knowledge of the operation and maintenance of generating plant and preference will be given to applicants possessing the Higher National Certificate or equivalent qualification.

The appointment will be superannuable under the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, qualifications, experience, present appointment and salary, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, 26 Oakfield Road, Bristol 8, so as to be received not later than Monday, August 14, 1950.

R. C. BARRETT,
Divisional Secretary.

July 20, 1950. (F 469)

LONDON ELECTRICITY BOARD

TECHNICAL ASSISTANTS, DESIGN AND PLANNING BRANCH

APPLICATIONS are invited for the above positions in the Northern Sub-Area at Falcon House, Aldersgate Street, E.C.1.

Applicants should have had a sound technical education, preferably be Corporate Members of the I.E.E. and possess sound practical experience in the design, installation and operation of h.v. and l.v. underground distribution systems. Technical and administrative experience with an electricity authority will also be an advantage.

Pending classification and grading of the posts under the revised agreement of the National Joint Board, provisional salaries will be £550 per annum.

Application forms obtainable from Establishments Officer, 46 New Broad Street, E.C.2, on receipt of an addressed foolscap envelope, to be returned duly completed not later than August 5, 1950. Please quote EST/V.797/T on envelope and all correspondence.

(F 480)

NORTH WESTERN ELECTRICITY BOARD

No. 7 Sub-Area

APPOINTMENT OF OVERHEAD LINESMEN IN 'C' AND 'D' DISTRICTS

APPLICATIONS are invited for the positions of Linesmen in the Mains Department in 7C District (including Marple, New Mills, Chapel-en-le-Frith and Buxton) and 7D District (Macclesfield).

The duties will include the carrying out of all work in connection with the erection and maintenance of overhead transmission, distribution, service and street lighting lines and any equipment or apparatus in connection therewith.

The wage and conditions of service will be in accordance with the National Joint Industrial Council Agreement for the Electricity Supply Industry, the present rate of pay being 34d. per hour (£6 4 0 for a forty-four hour five-day week).

Applications, stating age, training, experience, present position and wage, should be received by J. Harwood Lumsden, Esq., M.I.Mech.E., A.M.I.E.E., No. 7 Sub-Area Manager, The North Western Electricity Board, Electricity Offices, Chapel Street, Hazel Grove, not later than Saturday, August 5, 1950. (F 470)

EAST MIDLANDS ELECTRICITY BOARD

Leicester Sub-Area

APPLICATIONS are invited for the post of TECHNICAL ASSISTANT (Testing) in the Leicester Testing Department.

Applicants should possess a university degree or Higher National Certificate in Electrical Engineering, and should have served an engineering apprenticeship. Experience in a works' test room would be an advantage, while the candidate should possess intimate knowledge of the testing of cables, transformers, and switchgear, and be capable of writing good technical reports.

The salary will be in accordance with the revised National Joint Board Schedule, Class "G," Grade 10 (£539-£561 per annum) and the appointment will be superannuable under the terms and conditions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating qualifications, experience, and present appointment, should be submitted to the Manager, Leicester Sub-Area, The East Midlands Electricity Board, Charles Street, Leicester, by August 19, 1950.

F. H. De KEYSER,
Secretary.
(F 448)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

STATION SHIFT CONTROL ENGINEER—AVON

APPLICATIONS are invited from suitably qualified engineers for the position of Station Shift Control Engineer, at Avon Generating Station, Warwick.

Candidates should have practical experience in the operation of generating-station switchboards.

The salary will be in accordance with Class "E," Grade 10, of the National Joint Board Schedule, at a commencing salary of £488 per annum, and the appointment will be superannuable.

Applications should be submitted on the official form of application, which may be obtained from the Divisional Establishments Officer at the undermentioned address, and be returned not later than August 14, 1950.

W. S. BURGE,
Divisional Controller.

British Electricity House,
Barker Gate, Nottingham.
July 18, 1950. (F 463)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following posts:

No. 5 (Wakefield) Sub-Area

(1) SENIOR ASSISTANT (System Design). N.J.B. Schedule, Class "J," Grade 4. £939-£983 per annum. (Vacancy No. 39/50.)

Applicants must be capable, under the direction of the Sub-Area Engineer, of taking charge of an engineering section. Duties and responsibilities include:

The assessment of load growth on all existing Sub-Area networks operating at voltages up to 66 kV.

On networks operating at 11 kV and below, the detail design of reinforcements and extensions and the preparation of relevant technical reports, the design of substations, overhead and underground distribution circuits.

Applicants must be Corporate Members of the Institution of Electrical Engineers, and should have a wide experience in the operation and design of urban and rural networks.

(2) SECOND ASSISTANT ENGINEER (System Design). N.J.B. Schedule, Class "J," Grade 7. £736-£770 per annum. (Vacancy No. 39/50.)

Applicants must be capable of assisting the Engineer to be appointed to the vacancy described in (1) above, be Corporate Members of the Institution of Electrical Engineers, and should have similar, but less comprehensive, experience. Special experience in network and/or substation design will be an advantage.

Applications, stating the vacancy number, and giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, within 14 days of the appearance of this advertisement.

No. 6 (Hull) Sub-Area

INSTALLATIONS ASSISTANT (Bridlington District). N.J.B. Schedule, Class "D," Grade 10. £465-£481 per annum. (Vacancy No. 40/50.)

Candidates should have had practical experience in general wiring and installation work, testing and meter fixing, and be able to supervise repairs and reconditioning of electrical apparatus.

Applications, stating the vacancy number, and giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston-upon-Hull, within 14 days of the appearance of this advertisement.

(F 471)

CITY AND COUNTY BOROUGH OF BELFAST

Electricity Department

APPLICATIONS are invited for the positions of:—
(a) TURBINE ROOM MAINTENANCE ENGINEER (Mechanical).
(b) MAINTENANCE ENGINEER (Electrical).

Applicants for (a) must have a University Degree or the Higher National Certificate in Mechanical Engineering or be Corporate Members of the Institution of Mechanical Engineers, and should have workshop training, preferably with a manufacturer of large turbines, and extensive experience in a responsible position in the erection, maintenance and testing of steam-driven turbines and mechanical auxiliary plant appertaining to a large modern power station.

Applicants for (b) must have a University Degree or the Higher National Certificate in Electrical Engineering or be Corporate Members of the Institution of Electrical Engineers, and should have workshop training, preferably with a manufacturer of large electrical machinery, and extensive experience in a responsible position in the erection and maintenance of alternators, e.h.t. and l.t. switchgear, motors and all electrical auxiliary plant appertaining to a large modern power station.

The salary for each position is in accordance with Grade 7, Class "G" of the Northern Ireland Joint Board Schedule of Salaries for Technical Engineers on the staff of Authorised Undertakers. The scale at present is £651 per annum for the first two years £665 for the third and fourth years and £679 after the fourth year.

Preference will be given to ex-Service candidates possessing the required qualifications.

Applications which must be made on the official forms obtainable from the City Electrical Engineer and General Manager, Electricity Department, East Bridge Street, Belfast, and accompanied by copies of not more than three recent testimonials, must be posted or delivered so as to be received by the Town Clerk not later than 4 p.m. on Friday, August 11, 1950.

Canvassing in any form, oral or written, direct or indirect, will, if proved to the satisfaction of the appointing authority, disqualify a candidate for appointment.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast. (F 491)

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited for the position of DEPUTY POWER STATION SUPERINTENDENT at Back o' th' Bank Generating Station, Bolton.

Candidates should be qualified engineers, having had a technical education and practical experience in the operation and maintenance of a modern steam generating station, and preferably be corporate members of the Institution of Mechanical Engineers, or of the Institution of Electrical Engineers, or have equivalent qualifications.

The present capacity of the station is 107·5 Mw. and the salary will be in accordance with Grade 3, Class "G," of the revised N.J.B. Schedule, i.e., £885 to £927 per annum.

Applications, stating age, qualifications, present position, and giving full details of education and experience, should be received by the Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than August 12, 1950. (F 451)

SOUTHERN ELECTRICITY BOARD

No. 4 (Bournemouth) Sub-Area

APPOINTMENT OF ELECTRICAL DEMONSTRATORS (FEMALE)

APPLICATIONS are invited for the posts of Electrical Demonstrators at the following districts in the No. 4 (Bournemouth) Sub-Area of the Board:—

Bournemouth District.
Lyndhurst District (Winchester).
Southampton District.
Yeovil District.

Applicants must be qualified to advise generally on the utilisation of electrical appliances, competent to give demonstrations of cooking and apparatus in service centres and in the homes of consumers, and able to assist in showroom duties generally.

If eligible, the successful applicants will, subject to certain conditions, be required to join the B.E.A. and Area Boards' Superannuation Scheme.

The salary will be within the range of £310-£390 per annum (progress beyond £350 per annum is dependent on a certificate of capability), in accordance with Grade 1 of the National Joint Council's Salary Agreement, 1950, and the appointment will be subject to National Joint Council Conditions of Service.

Applications, on forms obtainable from the Sub-Area Secretary, 1 Priory Road, Bournemouth, must reach him in envelopes endorsed "Electrical Demonstrator" in the top left-hand corner, not later than August 4, 1950.

F. W. KEMPTON,
Secretary.
(F 447)

CROWN AGENTS FOR THE COLONIES

ELECTRICAL ENGINEER required by the Central Electricity Board, Federation of Malaya, for three years, with prospect of permanency. Salary (including expatriation pay) payable in local currency, equivalent at the present Government rate of exchange to £742 a year, rising to £1,652 a year. Commencing salary according to age and experience. Cost of living allowance equivalent to £210 to £525 a year, according to salary and dependants. Free passages. Liberal leave on full salary. Candidates, between 26 and 35 years of age, must have had a good general education and be corporate members or graduates of the Institution of Electrical Engineers, or possess equivalent qualifications, and have had sound training in electrical engineering, with experience in the installation and maintenance of all electrical equipment in large modern thermal power stations.—Apply at once by letter, stating age, full names in block letters, whether married or single, and full particulars of qualifications and experience and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting M/N 2545(3B) on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (F 443)

WALSALL EDUCATION COMMITTEE

Walsall Technical College

APPLICATIONS are invited for the post of ASSISTANT LECTURER IN ELECTRICAL ENGINEERING. The person appointed will also be expected to teach the theory and practice of electric installation work for City and Guilds Courses "B" and "C." Salary will be in accordance with the Burnham Technical Scale.

Further particulars and application forms may be obtained from Principal, Walsall Technical College, Bradford Place, Walsall.

V. J. MOORE,
Director of Education.
(F 467)

MIDLANDS ELECTRICITY BOARD

South Staffs. and North Worcs. Sub-Area

APPOINTMENT OF JUNIOR ENGINEER

APPLICATIONS are invited for the above appointment in the Stourbridge district of the South Staffs. and North Worcs. Sub-Area.

Applicants should have had experience in distribution work, including operation and maintenance of h.v. and l.v. underground cables, sub-stations, etc. Appropriate technical qualifications will be considered an advantage.

The appointment will be in accordance with N.J.B. conditions and the provisional salary, subject to negotiation, will be £375 per annum.

Applications, stating age, qualifications, experience and present salary should be sent within fourteen days to Mr. T. G. Keeler, Manager, South Staffs. and North Worcs. Sub-Area, Midlands Electricity Board, Toll End Road, Tipton.

A. STEPHENS,
Secretary.

July 21, 1950. (F 496)

BRITISH BROADCASTING CORPORATION

B.B.C. invites applications for the following posts in Planning and Installation Department, London

POWER SECTION: Two posts—salaries in grades with maxima £890 per annum and £680 per annum and annual increments of £40 and £30 respectively. Applicants should possess a University degree in Electrical Engineering or equivalent qualification and must have had practical training and experience with a manufacturing concern. They must have broad knowledge of theory and practice of a wide variety of electrical plant, including switchgear transformers, rectifiers, a.c. and d.c. motors and generators, contactor and control gear, batteries, cables, etc. Knowledge of products of leading electrical manufacturers and of diesel engine equipment an advantage. For senior post familiarity with estimating procedure, examination and summarising of tenders, preparation of specifications for power plant and ability to supervise layout and diagram work are essential. For other post applicants must have initiative and a critical outlook and be able to carry out works and site tests and deal with the necessary correspondence.

WIRING SECTION: Two posts—salaries as above. Applicants should preferably have served an apprenticeship with a reputable firm of electrical contractors and be fully experienced in the planning and execution of all types of low and medium pressure electrical installation work, in estimating, writing specifications for wiring installations and in examining and summarising tenders. For the senior post they must be able to supervise contracts, including complete wiring installations of any magnitude.

Applications, stating age, qualifications and experience, and for which post application is being made, to reach Engineering Establishment Officer, Broadcasting House, London W.1, within seven days. (F 392)

COUNTY BOROUGH OF BARROW-IN-FURNESS

Borough Engineer and Surveyor's Department

ASSISTANT ELECTRICAL ENGINEER

APPLICATIONS are invited for the permanent appointment of Assistant Electrical Engineer on Grade Va of the National Scales of Salaries for Local Authorities' Staffs.

The duties of the post will include the preparation of plans, specifications and estimates for electrical installations in municipal buildings, and the supervision of work in progress. Comparable experience is essential and some knowledge of street lighting would be an advantage.

Further details of the post, conditions of appointment and forms of application may be obtained from the Borough Engineer and Surveyor, to whom completed application forms must be returned not later than Friday, August 4, 1950. (F 387)

SOUTH EASTERN ELECTRICITY BOARD

SHOWROOM ASSISTANTS (TWO) (MALE).

Wilton Showroom.

SENIOR Showroom Assistant. Salary £390 by £20 to £450 per annum under Grade 2 of the N.J.C. Agreement. Showroom Assistant. Salary £135 at age 16, rising to £310 at age 20, and thereafter to £365 per annum. Superannuation will be arranged for these positions.

Applications, giving two referees, must reach D. C. Thomson, Esq., B.Sc., M.I.E.E., Kingston and District Manager, South Eastern Electricity Board, 22 Claremont Road, Surbiton, Surrey, by August 8, 1950.

A. L. BURNELL,
Secretary.

July, 1950. (F 475)

MIDLANDS ELECTRICITY BOARD

North Staffordshire Sub-Area

APPLICATIONS are invited for the position of DRAUGHTSMAN in the Stafford District Office of the North Staffs. Sub-Area.

Applicants should have had experience in mains record work and the preparation of plans for mains extensions.

The provisional salary of £400 per annum will be subject to negotiation with such organisations as are appropriate.

Applications, stating age, qualifications, experience and present salary should be sent within fourteen days to Mr. H. A. P. Caddell, Manager, North Staffs. Sub-Area, Midlands Electricity Board, 31 Kingsway, Stoke-on-Trent

A. STEPHENS,
Secretary.

July 20, 1950. (F 495)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following posts at Poole Generating Station, Hamworthy, Dorset.

CLERICAL ASSISTANT, Grade 3 (£450-£510).

Responsible for wages section. Wide experience of preparation of wages sheets, P.A.Y.E. and superannuation and other deductions essential.

Knowledge of mechanised accounting desirable.

CLERICAL ASSISTANT, Grade 3 (£450-£510).

Wide experience of establishment matters including the engagement of manual staff, the application of agreements relating to conditions of service for N.J.I.C., N.J.B. and N.J.C., personnel and the joint advisory machinery and welfare.

A knowledge of the administration of canteens, first aid and safety regulations is desirable. Shorthand and typing will be an advantage.

CLERICAL ASSISTANT, Grade 2 (£390-£450).

Responsible for stores section. Wide experience of stores records and stock control, including certification of invoices, recording of coal consumed accounts and costing is essential.

CLERK, GENERAL, CLERICAL GRADE.

Candidates should be from 19-26 years of age and possess a School Certificate or its equivalent. Preference will be given to persons with a knowledge of general office routine, wages, P.A.Y.E. and costing.

Shorthand and or typing will be an advantage. Salary £191-£410 according to age.

The conditions of service will be those approved by the N.J.C. for the electricity supply industry and successful candidates may be required to undergo a medical examination.

The posts are superannuable in accordance with the authority's scheme.

Application forms may be obtained from the undersigned, and should be returned not later than August 11, 1950.

P. D. A. OLIVER,
British Electricity House, Divisional Secretary.
High Street, Portsmouth. (F 499)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

Chief Engineer's Department

APPLICATIONS are invited for an ASSISTANT ENGINEER in the construction section of the Chief Engineer's department at headquarters.

Candidates should have obtained the Higher National Certificate in electrical engineering or an equivalent qualification and should have had experience in the preparation of tenders, supervision of contracts relating to e.h.t. and l.t. system extensions and in the design of overhead lines and sub-stations. They should also be prepared to assist in the work of the section.

The salary for the post will be in accordance with the National Joint Board Revised Agreement, Grade 2, Class "AX BX," and will commence at a point within the range of £752-£911 per annum depending upon qualifications and experience. The appointment is superannuable.

Applications, giving age, qualifications, experience, present position and salary, should be addressed to the Chief Engineer, South East Scotland Electricity Board, 52 Melville Street, Edinburgh, 3, so as to reach him not later than Saturday, August 19, 1950.

THOMAS J. MULLAN,
Secretary.

South East Scotland Electricity Board,
52 Melville Street, Edinburgh, 3. (F 482)

BRITISH BROADCASTING CORPORATION

B.B.C. invites applications for the post of HEAD OF POWER SECTION, Planning and Installation Department, London. Applicants should be graduates in electrical engineering or possess equivalent qualifications and have had a sound practical training, preferably including an apprenticeship with a leading electrical manufacturer. They should have had a wide experience of a variety of electrical plant, including h.v. and l.v. switchgear and cable work; protective systems and gear; transformers, rectifiers, motors, generators, alternators of all sizes and control switch gear; prime mover plant, including diesel engines up to 750 b.h.p. They must possess administrative experience and ability to control staff and to deal with correspondence and tenders and the operation of power supply agreements. Salary is in a grade with annual increments of £60 and a maximum salary of £1,360 per annum.—Applications, stating age, qualifications, details of past and present employment, should reach the Engineering Establishment Officer, Broadcasting House, London W.1 within seven days of the appearance of this advertisement. (F 449)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Aberdeen Area

APPLICATIONS are invited for appointment as MAINS ASSISTANT from persons having experience of underground and overhead distribution systems.

Applicants should preferably hold technical qualifications of Higher National Certificate standard.

Provisional salary within the range of £538 to £560 per annum.

Applications should be addressed to the undersigned within 10 days from the publication of this notice.

ALEX. GARDNER,
Area Manager.

The North of Scotland Hydro-Electric Board,
Millburn Street, Aberdeen. (F 492)

SINGAPORE MUNICIPALITY

ELECTRICITY DEPARTMENT

CHARGE ENGINEERS. Permanent Staff, required for 3 shift duties in the Singapore Power Station. Present capacity, 37,000 kW, with proposed extensions to 87,000 kW.

Experience of extra high-tension 3-phase generation in a modern high-pressure steam power station is essential. Appointment subject to medical examination.

Basic salary scale, $440-$870 per month. Starting point according to qualifications and experience. Graduated scale of allowances, e.g., present allowance on $560 p.m. basic salary amount to: Expatriation $110 p.m., plus cost of living, $192 p.m. for single man or $246 p.m. for married man, or $318 p.m. for married man with family. Annual increments, $30 p.m. Local taxation much lower than England. One Straits dollar equals 2s. 4d. Thus a married man with family on basic salary of $560 would draw equivalent of £1,383 sterling per annum.

Quarters, with heavy furniture, provided at 8 per cent. of salary or housing allowance up to 12 per cent. in lieu. Initial engagement on three years' agreement; eight months' leave after four years' service. Free medical attention. Passages paid, including family. Compulsory provident fund contribution, 7½ per cent. of salary, and Municipal Commissioners donate 7½ per cent. for first 10 years, rising to 20 per cent. after 20 years' service.

Applications, in duplicate, with full personal and technical information and copies of three testimonials, to Messrs. Peirce and Williams (agents to the Municipal Commissioners), 1 Victoria Street, London S.W.1. (F 444)

SOUTHERN ELECTRICITY BOARD

No. 4 (Bournemouth) Sub-Area

APPOINTMENT OF ASSISTANT ENGINEER AT THE BISHOP'S WALTHAM BRANCH OF THE SOUTHAMPTON DISTRICT

APPLICATIONS are invited for the post of Assistant Engineer at the Bishop's Waltham Branch of the Southampton District of the Board.

Applicants should have had experience in the design, construction, operation, and maintenance of h.v. and l.v. distribution systems (overhead and underground), sub-station plant, and distribution equipment. They should also be able to negotiate wayleaves and prepare the necessary agreements and records. Some knowledge of surveying will be considered an advantage.

If eligible, the successful applicant will, subject to certain conditions, be required to join the B.E.A. and Area Boards' Superannuation Scheme.

The salary will be in accordance with the N.J.B. Schedule, Class "F," Grade 2 (£482-£490-£498 per annum) and the appointment will be subject to N.J.B. Conditions of Service.

Applications, on forms obtainable from the Sub-Area Secretary, 1 Priory Road, Bournemouth, must reach him in envelopes endorsed "Assistant Engineer, Bishop's Waltham," in the top left-hand corner, not later than August 4, 1950.

F. W. KEMPTON,
Secretary.
(F 450)

BRITISH ELECTRICITY AUTHORITY

North Eastern Division

APPOINTMENT OF SHIFT CHARGE ENGINEER, YORK POWER STATION

APPLICATIONS are invited for the position of Shift Charge Engineer at York Power Station.

Applicants should have had wide experience in the operation of generating plant and the possession of a Higher National Certificate or equivalent qualification would be an advantage.

The salary will be in accordance with the National Joint Board Schedule "A," Grade 7, Class "E" (£579-£608 per annum).

Superannuation will be in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Forms of application may be obtained from the Divisional Secretary (Establishments), British Electricity Authority, North Eastern Division, Carliol House, Newcastle-upon-Tyne, 1, to whom they should be returned to arrive not later than Saturday, August 12, 1950.

(F 476)

NORTH WESTERN ELECTRICITY BOARD

No. 4 Sub-Area

APPOINTMENT OF METER REPAIRER (MECHANICIAN)

APPLICATIONS are invited for the post of Meter Repairer (Mechanician) in the Testing Station at Preston.

Wages and conditions of service will be in accordance with the agreement of the National Joint Industrial Council for the Electricity Supply Industry, the present rate for Meter Repairer (Mechanician) being 35.00d. per hour, equivalent to £6 8s. 4d. for a 44-hour, 5-day week.

Applications, stating age, training and experience should be received by the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40-41 Lune Street, Preston, not later than Saturday, August 5, 1950. (F 483)

SOUTHERN ELECTRICITY BOARD

No. 2 (Newbury) Sub-Area

APPOINTMENT OF PLANNING ENGINEER, OXFORD

APPLICATIONS are invited for the post of Planning Engineer at Oxford.

The qualifications necessary will include experience in and ability to prepare proposals and estimates for extensions of h.v. and l.v. networks and sub-stations and to deal with preliminary work prior to construction. The appointment may involve stand-by duties.

The successful applicant will be required to join the B.E.A. and Area Boards Superannuation Scheme, if eligible.

The salary will be in accordance with N.J.B. Schedule, Class "G," Grade 7 (£651-£665-£679). N.J.B. conditions of service.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Road, Newbury and returned to him not later than August 11, 1950.

F. W. KEMPTON,
Secretary.
(F 481)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited for positions as BOILER HOUSE ENGINEERS at the Ribble Generating Station.

Candidates must have had experience in the operation of high pressure boiler plant. Previous experience in a generating station and possession of technical qualifications will be an advantage.

The salary will be in accordance with Grade 9, Class "K," of the N.J.B. Agreement, i.e. £493-£514 per annum. This salary is provisional pending negotiations with the appropriate body.

Applications, stating age, qualifications, present position, and giving full details of education and experience, should be received by the Esta lishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than August 5, 1950. (F 472)

MIDLANDS ELECTRICITY BOARD

North Staffordshire Sub-Area

APPOINTMENT OF FIRST ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the above position in the Stone District of the North Staffordshire Sub-Area.

Applicants must have had experience in all branches of distribution work including operation and maintenance of high and low voltage cables, overhead lines, sub-stations, etc. Appropriate technical qualifications will be considered an advantage.

Conditions of service will be in accordance with the National Joint Board Agreement and the salary will be in Class "D," Grade 5, £641-£655 per annum

Applications, stating age, present salary, full particulars of qualifications, experience and present position should be endorsed: "First Assistant District Engineer," and forwarded within fourteen days to Mr. H. A. P. Caddell, Manager, North Staffs. Sub-Area, Midlands Electricity Board, 31 Kingsway, Stoke-on-Trent.

A. STEPHENS,
Secretary.
July 20, 1950. (F 497)

CITY OF MANCHESTER

City Architect's Department

APPLICATIONS are invited for the following appointment on the permanent staff :—

ELECTRICAL ENGINEERING ASSISTANT (Salary A.P.T. Grade III, £450-£495 per annum).

Candidates must be capable of preparing schemes for electric lighting and power installations in all types of municipal buildings.

Forms of application can be obtained from, and must be returned, together with not more than three recent testimonials, to Leonard C. Howitt, B.Arch., F.R.I.B.A., City Architect, Town Hall, Manchester 2, by August 10, 1950, endorsed " Electrical Engineering Assistant."

PHILIP B. DINGLE,
Town Hall, Manchester, 2. Town Clerk.
July, 1950. (F 501)

ABERDARE CABLES, LTD., Aberdare, require immediately two experienced ESTIMATORS for handling overseas enquiries for paper insulated cables. State salary required and experience. (F 488)

AN interesting opportunity exists for a young and fully qualified ELECTRICAL ENGINEER with knowledge of electronics in connection with servo mechanism development for aircraft.—Write to Mr. G. Orloff, Chief Designer, British Messier, Ltd., Cheltenham Road East, Gloucester. (F 284)

APPLICATIONS are invited for the position of TECHNICAL DESIGN ENGINEER in the F.H.P. Motor Laboratory at a large electrical engineering company in the West London area. Experience of F.H.P. motor design and performance, and ability to accept full responsibility of a project from the initial design stage to factory production is essential. Applicants should possess Engineering Degree or equivalent qualifications. Salary will be in the region of £600 to £800 per annum according to qualifications.—Apply, giving details of age, education and job history, to the Employment Officer, Hoover Ltd., Perivale, Greenford, Middx. (F 361

COOKERY DEMONSTRATOR and HOME SERVICE EXPERT required permanently by manufacturers of domestic cooking appliances.—Apply, stating age, qualifications or diplomas, salary and experience, to Stoves Limited, c/1 Sales, Rainhill, Liverpool. (F 473)

DRAUGHTSMAN with experience of large transformer manufacture required by electrical engineering company in North-East London. Permanent position, with superannuation scheme, for suitable applicants. Good salary and working conditions. Write, stating age, experience and salary required, to Box No. 1545, Electrical Times. (F 453)

BROOK MOTORS LIMITED
HUDDERSFIELD

ALTERNATING CURRENT MOTOR AND CONTROL GEAR MANUFACTURERS

have vacancies in the following Departments for men with University or Technical Education to National Certificate Standard, preferably with military service completed :—

Production Planning

Electrical Design

Technical Sales

Successful applicants, who preferably should not be over 25 years of age, would have the opportunity of eventual Staff appointments.

Write, stating age and technical standard to:

THE MANAGING DIRECTOR
BROOK MOTORS LTD., HUDDERSFIELD
(F 313p)

DRAUGHTSMEN with experience in the fabrication of large steel tanks and vessels required by electrical engineering company in North-East London. Permanent position, with superannuation scheme, for suitable applicants. Good salary and working conditions.—Write, stating age, experience and salary required, to Box No. 1547, Electrical Times. (F 454)

ELECTRICAL BILLS OF MATERIAL CLERK, must be experienced in keeping records of electrical installation material and have working knowledge of electrical installation drawings and procedure. Apply by letter, stating salary required, experience, and when available to commence work, to: Chief Draughtsman, The Lummus Company Limited, 525 Oxford Street, London W.1. (F 423)

ELECTRICAL DRAUGHTSMAN required by major oil company for service in the Middle East. Must have served five years electrical engineering apprenticeship, and have had five years D.O. experience in connection with electrical layouts of large industrial plants with underground cable networks. Should possess Higher National Certificate. Graduate or associate membership of a corporate engineering body desirable but not essential. Maximum age limit 35 years. Attractive salary plus generous allowance in local currency. Free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension scheme.—Write, giving personal particulars and details of qualifications and experience, quoting Dept. F.192, to Box No. 2809, at 191 Gresham House, Old Broad Street, E.C.2. Applicants without above requirements will not be considered. (F 322)

ELECTRICAL DRAUGHTSMEN for oil refinery work, experienced in wiring and installation layouts and taking off quantities. Should be capable of laying out small sub-stations and switch-houses. Knowledge of cable layouts and flame-proof conduit work desirable. Five-day week, with paid overtime.—Apply by letter, stating age, experience, salary expected, and when free to commence work, to Chief Draughtsman, The Lummus Co., Ltd., 525 Oxford Street, London W.1. (F 357)

ELECTRICAL ENGINEER, age 23/30, required by consulting engineers for the design of, and preparation of specifications for, the electrical services and equipment for factories, public buildings, hospitals, etc. Applicants should hold degree or equivalent qualifications and have had experience in manufacturer's works. Salary £400 to £600 according to experience.—Write, stating age, qualifications and experience, to R. W. Gregory and Partners, Pilgrim House, Pilgrim Street, Newcastle-upon-Tyne, 1. (F 485)

ELECTRICAL ENGINEER required by old-established Essex electrical engineering firm, experienced in the preparation and execution of industrial electrification installations, preferably with flour mill experience, also conversions from existing to electric drive, including switchgear, alternators, transformers, shafting, drives and motors up to 500 h.p. A thorough knowledge of present-day practice is necessary. Permanent position would be offered to the right man and remuneration would be in accordance with capabilities.—Write, stating age, experience and salary required.—Box No. 1551, Electrical Times. (F 478)

ESTIMATING AND APPLICATION DESIGN ENGINEER wanted for works near London to handle inquiries. Experience of motor control gear design essential.—State experience and salary required to Box No. 1517, Electrical Times. (F 402)

ESTIMATING CLERK required for cable works in South London. Some experience of rubber and or paper cables desirable.—Write, giving full particulars of age, experience and technical training to Box No. 1555, Electrical Times. (F 484)

ELECTRICAL ENGINEERS required for service in Middle East. Applicants should (*a*) possess Ordinary or Higher National Certificate and have had full apprenticeship with heavy electrical equipment manufacturers or with a large colliery or allied fully electrified industry, or (*b*) possess a degree and have had two years' technical apprenticeship with similar firm to above. In each case applicants must have had at least three years' subsequent experience on the installation and maintenance of heavy electrical equipment. Maximum age limit 35 years. Attractive salary, plus generous allowance in local currency, free passages out and home, free medical attention, kit allowance, good leave arrangements, pension scheme.—Write, giving personal particulars and details of qualifications and experience, quoting Dept. F.191, to Box No. 2593, at 191 Gresham House, E.C.2. (E 415)

EXHIBITION ELECTRICIAN wanted immediately by exhibitions section of large commercial undertaking in the south. Applicants must have full knowledge of exhibition work and the position entails a certain amount of travelling. Headquarters for the post, which is superannuative, are at Barking, Essex. Applicants must state age, experience and qualifications to Box No. 1553 Electrical Times. (F 479)

EXPERIENCED ELECTRICAL LAYOUT DRAUGHTSMEN required immediately. Knowledge of aircraft electrics preferred but not essential.—Apply, stating age and details, etc., to Staff and Labour Manager, The Bristol Aeroplane Co., Ltd., Aircraft Division, Filton House, Bristol. (F 438)

INTERESTING and progressive position exists for ELECTRICAL DESIGN DRAUGHTSMAN in rapidly expanding company. Experience on light, relay and electro-magnetic components would be an advantage.—Apply to Mr. G. T. Atkins, Electrical Engineer, British Messier, Ltd., Cheltenham Road East, Gloucester. (F 285)

LONDON ELECTRICAL CONSULTANTS offer a 1-year appointment with possibility of permanent employment to qualified ENGINEER with first-class knowledge of L.T. distribution and power and lighting installations, and capable of designing and supervising large scale work. Only man of first-class experience will be considered. Salary range £600-£800 according to qualifications.—Write with full details to Box E.T.115, at 191 Gresham House, E.C.2. (F 383)

OLD-ESTABLISHED firm, 30 miles north of London, having occasional spare capacity for good-class work in (a) spinning department and (b) small brass foundry, seeks part-time SALES REPRESENTATIVE for each or both, other light engineering facilities being available. Good connection essential.—Reply in confidence, Box No. 1543 Electrical Times. (F 452)

MALE CLERK required for London sales office, with experience of engineering equipment.—Apply, giving full particulars, to General Sales Manager, Worthington-Simpson, Ltd., Queen's House, Kingsway, W.C.2. (F 385)

RECTIFIER ENGINEERS are required by the English Electric Company, Stafford. These vacancies are for qualified engineers for employment in the Design, Test, or Commercial Departments, and applicants with experience of Mercury Arc Rectifiers should write giving full details quoting reference 439 to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London S.W.1. (F 375)

SALES REPRESENTATIVES required in all areas for marketing an entirely new 5-amp switch of revolutionary design and phenomenal performance. Previous experience and sound established connections essential, particularly with Electricity Authorities, large contractors and Municipal Authorities. Good salary and commission plus car allowance. Write, stating age, experience, etc., and area thoroughly covered. Replies treated in strictest confidence.—Managing Director, Box No. 1469, Electrical Times. (F 287)

CONTROL ENGINEERS

CONTROL ENGINEERS for network operation required by Major Oil Company in Middle East for control centre covering operation of extensive overhead and underground transmission and distribution networks up to 66 kV. Applicants must possess Ordinary or Higher National Certificate in Electrical Engineering, and must be experienced in the operation of indoor and outdoor metal-clad switchgear at all voltages, transformers and associated substation equipment. Age not over 35. Attractive salary, plus generous allowance in local currency, free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension Scheme.—Write, giving personal particulars and details of qualifications and experience, quoting:

DEPARTMENT F.116 TO BOX NO. 2584 AT 191 GRESHAM HOUSE, E.C.2. (E 389p)

CABLE JOINTER

CABLE JOINTER urgently required by large industrial concern operating in the Middle East for h.v. jointing on underground cables up to 33 kV and for l.v. distribution networks. Applicants must be thoroughly experienced in modern methods. Maximum age limit, 35 years. Attractive salary, plus generous allowance in local currency. Free passages out and home, free medical attention, kit allowance, good leave arrangements, pension scheme. Write, giving personal particulars and full details of qualifications and experience, quoting

Dept. F.39, to Box 2814, at 191 Gresham House, E.C.2. (F 327p)

SENIOR METHODS ENGINEER required by Mid-Essex manufacturer of house service meters and electrical instruments. Applicants must be familiar with all aspects of manufacture and able to lay down efficient methods and estimated process times.—Apply, giving full details of previous experience, to Box No. 1513, Electrical Times. (F 398)

SHORT-CIRCUIT TEST ENGINEERS are required for the Nelson Research Laboratories of the English Electric Co., Ltd., Stafford. Applicants should possess a degree in electrical engineering and have experience of the operation and maintenance of heavy electrical plant. Duties will include the testing of heavy switchgear and applicants must be interested in development work.—Write, giving full details quoting reference 289C to: Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London S.W.1. (F 324)

SIX SENIOR DRAUGHTSMEN required by well-known Mechanical Engineers in London area. Must have sound technical engineering training and experience in the design of Boiler Mountings and auxiliary fittings. Five-day week. Pension Fund. Apply, stating age and full particulars of training, experience and salary required, to Box No. 1511, Electrical Times. (F 373)

TECHNICAL ASSISTANT (Electrical) required for Central London office for the design and layout of factory electrification schemes, including sub-stations, h.t. ring mains, transformers, m.t. switchboards, cabling, distribution boards, motors, starters, and lighting.

Applicants must be between 25 years and 30 years of age and must hold the H. N. Certificate in Electrical Engineering. Preference to man holding the Graduate Examination of the I.E.E. Five-day week. Superannuation scheme. Salary according to experience. Successful applicant would have to be passed by the Company's medical officer.

All applications (which should contain copies of two or more testimonials) will be treated in the strictest confidence and should be addressed to Personnel Dept. (FMD), Lever Bros. and Unilever Ltd., Unilever House, Blackfriars, London E.C.4. (F 447)

TECHNICAL SALES REPRESENTATIVES required for London and Home Counties, with experience of pumping machinery preferred, but not essential.—Apply, giving full particulars, to General Sales Manager, Worthington-Simpson, Ltd., Queen's House, Kingsway, W.C.2. (F 384)

TRANSFORMER DRAUGHTSMEN SENIOR AND JUNIOR required, with experience up to 500 kVA. Please write, stating age, experience and salary required, to Nevelin Electric Co. Ltd., Purley Way, Croydon. (F 468)

THE FORD MOTOR CO., LTD., has an immediate vacancy in their power house (present capacity equivalent to 70,000 kWs) for a MECHANICAL MAINTENANCE ENGINEER. Applicants should have extensive maintenance experience of modern high-pressure boilers, turbines, and auxiliary power-house plant. Membership of professional institution or equivalent qualifications essential. Commencing salary £750 per annum. Successful candidate will be appointed to the company's permanent staff, with appropriate pension rights.—Applications, giving full particulars, should be made to Ford Motor Co., Ltd., Salaried Personnel Department, Dagenham, Essex. (F 356)

TRANSFORMER ESTIMATOR TECHNICAL CORRESPONDENT required. Must be capable of dealing with tenders for home and overseas business and be experienced in that direction. Practical experience an advantage. Applications, stating age, qualifications, experience and salary required should be addressed to the Employment and Welfare Manager, Messrs. Johnson and Phillips, Ltd., Victoria Way, Charlton, S.E.7. (F 487)

VICKERS-ARMSTRONGS, LTD., Weybridge, invite applications for the post of PROJECT ENGINEER to be in charge of certain special projects. Qualifications required for the post include experience of control methods and knowledge of electronics and instruments.—Write stating experience and qualifications, to Employment Manager, Weybridge Works. (F 505)

VICKERS-ARMSTRONGS, LTD., Weybridge, invite applications for the post of ELECTRONIC ENGINEER to take part in electronic side of special projects.—Write, stating experience and qualifications to Employment Manager, Weybridge Works. (F 506)

APPOINTMENTS WANTED

APPLIANCE development, CHIEF ENGINEER (38), with experience of domestic and commercial cooking equipment, water heaters, small appliances, control mechanisms, and general light engineering, seeks new appointment. Many years in charge of technical departments. Good knowledge of production methods, patent procedure, Admiralty, Ministry, B.E.A., and export requirements.—Box No. 1493, Electrical Times. (F 351)

ELECTRICIAN (37), 20 years' experience, desires maintenance post with accommodation. Bungalow for sale to person wishing to retire whose post he could fill.—Box No. 1353, Electrical Times. (F 22)

O.N.C. (ELEC.), exp. D.O., generation, requires post with small engineering firm. Test-bed or work requiring good theoretical knowledge. B'ham, Coventry, Leicester area.—Box No. 1549, Electrical Times. (F 477)

SALES ENGINEER (35), A.M.I.E.E., requires post with scope for initiative. Midland area. Car owner.—Box No. 1541, Electrical Times. (F 441)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service fully guaranteed.—Edgware 8631 (4 lines). Service Electric Co., Ltd., Stanmore, Middx. (D 324)

ARMATURE ROTOR AND STATOR WINDING. We specialise in the repair and rewind of all types of electrical machines from fractional h.p. upwards. Special departments for vacuum cleaners, dryers, portable tools, etc. All work fully guaranteed.—Walter Crane Greencoat Electrical Works, Westgate, Wakefield. Telephone 2172. (A 4)

CASTINGS, Fisher Foundries, Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (F 270)

ZEROS REFRIGERATORS.—Complete range of repair and service now available. Equipment reconditioned to conform to pre-war manufacturers' specifications.—Time Engineers, Refrigeration Specialists, 60 Southend Road, Rainham, Essex. Tel.: Rainham 2358; or Southern Area Agency. Tel.: Springpark 4217. Electrical Spares supplied to the trade. (A 639)

WANTED

A.C./D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Phone: Chiswick 5105. (A 20)

PLATING rectifier required with control gear, In. 400 V 3 ph., Out. 3,000 amp, 8 V.—Full particulars, Duracrome, Sudrey Street, London S.E.1. (F 461)

WANTED, AIRCRAFT IGNITION EQUIPMENT, Magnetos, Sparking Plugs, Vibrators, etc.—Box No. 1539, Electrical Times. (F 439)

WANTED.—D.C. and a.c. ball-bearing MOTORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London N.1. (A 13)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (A 16)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady St., Bethnal Green, E.1. (A 1)

WANTED.—Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling.—Apply, giving full details to Midland Iron and Hardware Co., Cradley Heath. (A 5)

FOR SALE

CABLES & WIRE

SPECIAL OFFER: V.I.R. CABLE. Famous make. Factory fresh. 1/044, £7 4/-; 3/029, £9 4/-; 3/036, £11 4/-; 7/029, £14 2/-; 7/036, £18 8/-; 7/044, £26 8/-; all per 1,000 yd., 50 yd. coils.—Northern Industries, Snow Hill, Manchester 4. (D 50)

TINNED Copper Wire, 37 x 16 gauge, about ½in. diameter; approximately two miles.—Offers to Eastwoods, Ltd., Engineering Department, 158-160, City Road, E.C.1, Clerkenwell 4333. (F 459)

DOMESTIC APPLIANCES

IMMERSION HEATERS. Grubb 2 kW and 3kW standard voltages, all lengths, 12 in. to 36 in. Also 4kW (non-taxable), 16 in. to 36 in. Fully guaranteed and immediate delivery. For illustrated brochure, latest lists and trade terms write distributors, John Owner and Co., Springfield Road, Birmingham 13. Tel.: Spr. 2639. (C 392)

GENERATING PLANT

ALTERNATORS from stock, 400/440 V, 3-phase, 50 c/s, with Exciters and switchboards. 80 kVA "GEC" 1,000 r.p.m. 40 kW "ECC," 750 r.p.m. 28 kVA "Crompton Parkinson," 1,500 r.p.m.—Full details, write: Thos. W. Ward Ltd., Albion Works, Sheffield. Phone 26311 (ex 347). (E 109)

DIESEL ALTERNATOR Sets from stock up to 100 kVA, 1 and 3 phase, standard voltage, details post free on request.—Thos. W. Ward Ltd., Albion Works Sheffield. Phone 26311 (ex 347). (E 108)

FOR disposal: 1 British Westinghouse d.c. generator compound wound 20 kW, 200 V, 1,050 r.p.m.; 1 open-type slate switchboard for above complete with voltmeter and ammeter; 1 British Electric Co. d.c. generator, 50 kW, 250 amp, 200 V, 820 r.p.m.; one 76 b.h.p., 440 V, 50 c.s, 3-phase, 1,450 r.p.m., slip-ring motor, complete with oil-immersed main switch and starter, by British Electric Plant Co.—Maxwells (Dundee), Ltd., St. Andrew's Street, Dundee. (F 440)

GENERATOR SETS. Three Diesel-engine Generator Sets, 62 kVA, 400/230 V, 3-phase, 4-wire, 50 c/s. Complete units incorporating cooling system, meters, switchboard, batteries and automatic voltage regulator. These sets have been in use only during the industrial staggered hours periods and they are in excellent condition. Price £1,000 each as they stand.—J. W. Squire, Ltd., 169-171 Humberstone Road, Leicester (Phone 65169). (F 367)

ONE Russel Hipwell 30-kVA Portable Generator, 400/230 V, a.c.—Ondura, Ltd., Keighley. (F 343)

1 ALTERNATOR, G.E.C. 6,500 kW 0.9 power factor 6.6 kV 3-phase 50 c/s, at 500 r.p.m. Two-bearing Alternator, complete with exciter and bedplate, together with panel.—Apply: C. J. Rice, 137 Mayplace Road West, Bexleyheath, Kent. Tel.: Bex. 3282. (F 494)

100 KVA MODERN OIL ENGINE ALTERNATING SET, comp. Vert. 6 cyl. Solid Injection Oil Engine on baseplate coupled to 400/230 V, 3-phase, 50 c/s, 1,000 r.p.m. Alternator. Details on request.—Thos. W. Ward Ltd., Albion Works Sheffield. Phone 26311 (ex 347). (E 112)

LIGHTING EQUIPMENT

FLUORESCENT SHELLS.—High quality stoved troughs 14s. 9d. Hexagon battens 17s. 6d., other pro rata. Complete fittings fully guaranteed at very competitive prices.—Cowling & Holdsworth, No. 1 Factory, Romside Trading Estate, North Street, Romford 7282. (F 63)

PURLEY CHOKES AND BALLASTS. Silent operation, excellent performance, efficient, long life, vacuum impregnated, quick delivery. Low price (e.g. Purley Queen, 80 watts, 14/6 each, less quantity and cash discounts). Quotations for export.—F. W. Blanshard, Ltd. (Dept. ET), Purley, Surrey. (E 343)

METERS

A.C. and D.C. quarterly and prepayment METERS.—Electric Meter Co., Melville Lane, Torquay. (F 456)

HOUSE service METERS from 5/- guaranteed two years.—Electric Meter Co., Melville Lane, Torquay. (F 457)

HOUSE SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (C 51)

METERS A.C. AND D.C. new and reconditioned, all types. Quarterly, single and three-phase, 3- and 4-wire 2/5 to 1,000 amp. Prepayment, single and double tariff, single, dual and triple coin, fixed and variable tariff, 2½ to 50 amp M.D.I. Billiards switches, rent collectors. Prices from 5/-, carriage paid, two-year guarantee. Immediate delivery. Illustrated catalogue from the Electric Meter Company, 16 Melville Lane, Torquay. (F 455)

MOTORS & STARTERS

ELECTRIC MOTORS, GENERATORS, TRANSFORMERS A.C. & D.C.
STARTERS, SLIP RING & D.C., SEMI-AUTOMATIC
Any voltage, new, short delivery, all types of revolving electrical power.
ELECTROPOWER COMPANY LIMITED
Kingsbury Works, Kingsbury Road, London N.W.9.
Telephone: COLindale 4621/2. (D 17p)

A.A. ELECTRICAL CO.—FOR A.C./D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS new or reconditioned units.—Chiswick 5196, Fairlands 6279, 67 Rothschild Road, W.4. (A 19)

A.C. and D.C. MOTORS, Alternators, Generators, Generating Sets, Transformers, Welding Equipment, Plaring Plant, Control Gear, Switchgear, Portable Electric Tools, etc.—Write for current electrical stock list, Post free: Thos. W. Ward Ltd., Albion Works, Sheffield. Phone 26311 (ex 347). (E 107)

A.C. and D.C. MOTORS, GENERATORS, from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 8631/4. (A 476)

A.C. and D.C. MOTORS, GENERATORS, SWITCHGEAR, etc., always in stock. Let me have your inquiries.—G. E. Whittaker, Wellington Mill, Bolton Road, Blackburn. Tel.: 7232. (A 12)

A.C. and D.C. MOTORS, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Ltd., Milo Road, East Dulwich, S.E.22 (Forest Hill 2278-9). (A 10)

BRAND NEW A.C. MOTORS, 1/3 to 90 h.p. Slip Ring and Squirrel Cage, 400/440 V, 3-phase, 50 c/s at 750, 1,000 and 1,500 r.p.m. With or without control gear. Immediate dispatch ex stocks, attractive prices.—Full details, post free, from: Thos. W. Ward Ltd., Albion Works, Sheffield. Phone 26311 (ex 347). (E 110)

D.C. ELECTRIC MOTORS. 120 h.p. 460 V d.c. by Metropolitan Vick, 1,400/1,600 r.p.m., compound wound, bare shaft ext. 100 h.p. 480 V d.c. by L.D.C., 600 r.p.m. cont. rated, compound wound stand, shaft ext. Four unused 88 h.p., 460/480 V d.c. by Brush, 1,400 r.p.m., cont. rated, compound wound, bare shaft ext. 86 h.p. 460/480 V d.c. by Brush, 1,400 r.p.m., screen protected bare shaft ext. Four 35 h.p. 460 V d.c. by Ransome, 1,000 r.p.m., screen protected shunt interpole. 30 h.p. 500 V d.c. by Crompton, variable speed 900/1,800 r.p.m., compound wound, bare shaft ext. Two 30 h.p. 500 V d.c. by L.D.M., 750/1,100 r.p.m., cont. rated, shunt interpole wound, stand, shaft ext. Totally encl. 75 h.p. 220 V d.c. by Laurence Scott, 1,300 r.p.m., cont. rated, compound interpole, drip-proof frames. External fan cooled. 75 h.p. 220 V d.c. by Met-Vick, 314 r.p.m., shunt interpole. Screen protected type with drip-proof cowl at driving end. Fan cooled, stand, shaft ext. Four 43 h.p. 230/240 V d.c. by Brush, 720 r.p.m., cont. rated, screen protected type, bare shaft ext. 40 h.p. 220 V d.c. by L.D.M., variable speed 700/1,000 r.p.m., cont. rated, ribbed carcase frame, stand, shaft ext. External fan cooled. Nine 36 h.p. 220 V d.c. by L.D.C., 1,850 r.p.m. cont. rated, compound interpole, taper shaft ext.—George Cohen, Sons and Co., Ltd., Wood Lane, London, W.12. Tel.: Shepherds Bush 2070 and Stanningley, near Leeds. Tel.: Pudsey 2241. (F 474)

FOR ELECTRIC MOTORS, GENERATORS, ALTERNATORS, SWITCHGEAR, please send your inquiries to Oldfield Engineering Co., Ltd., 96 East Ordsall Lane, Salford 5. (C 296)

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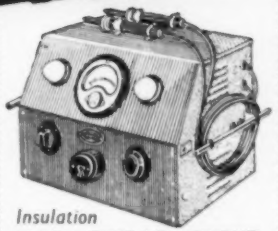

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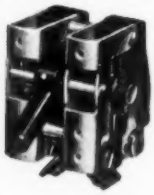

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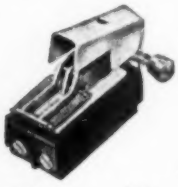

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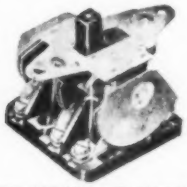

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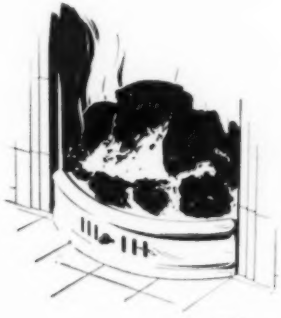

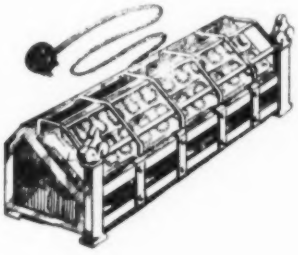

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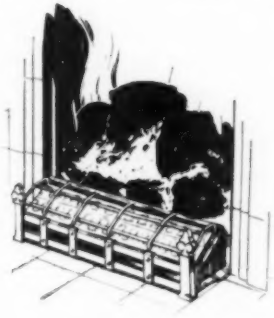

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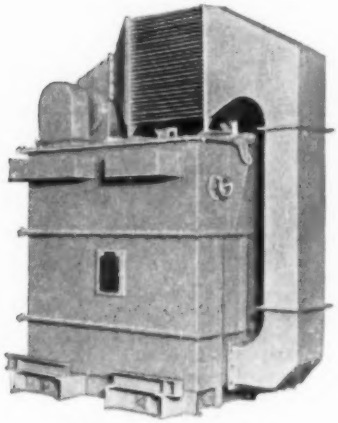

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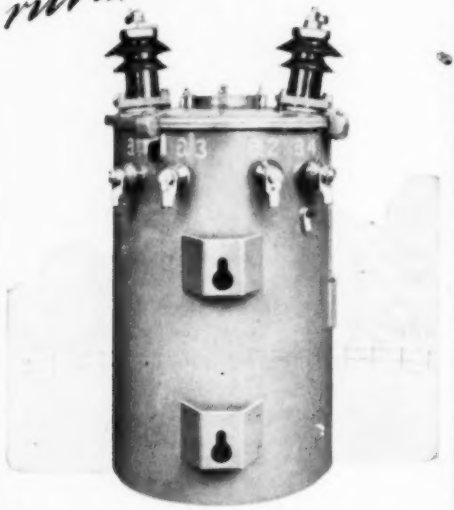

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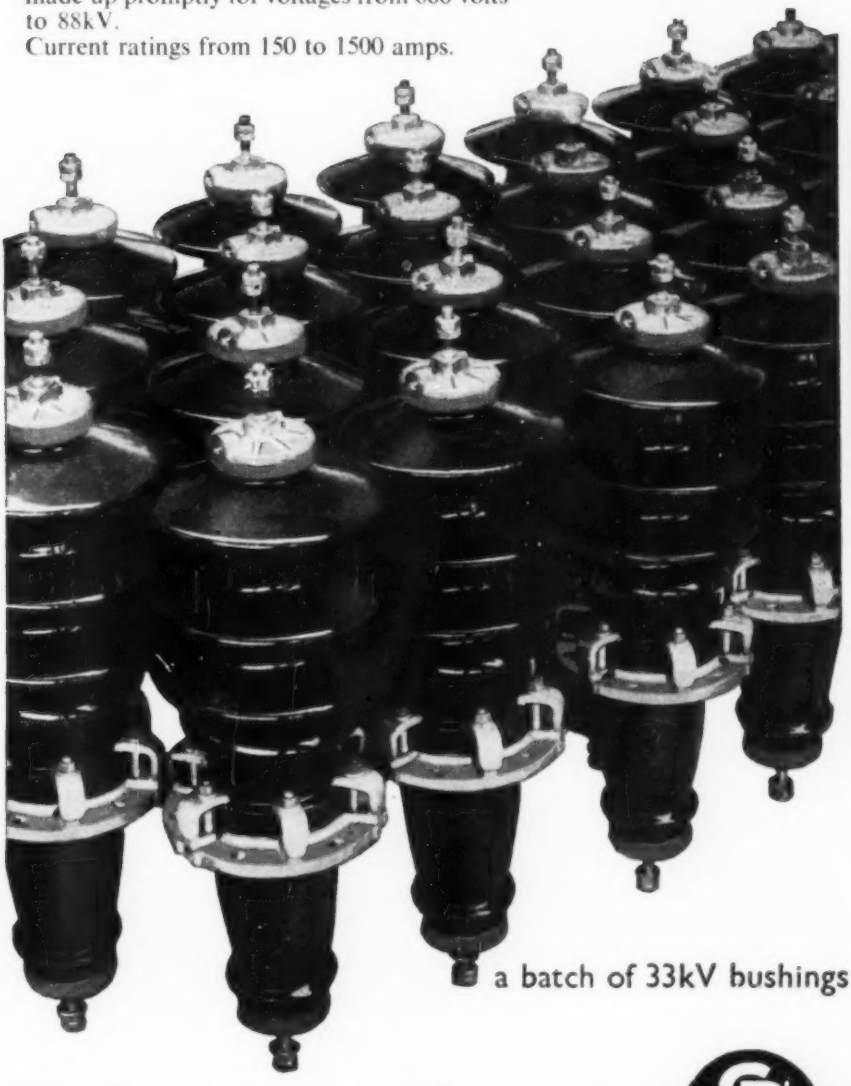

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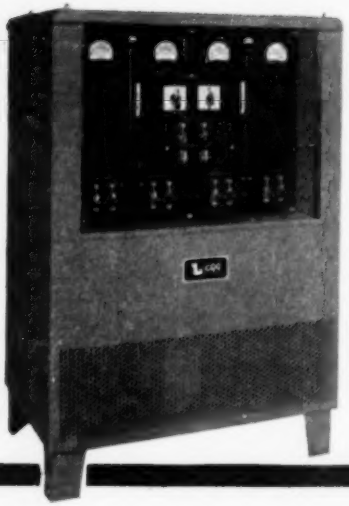

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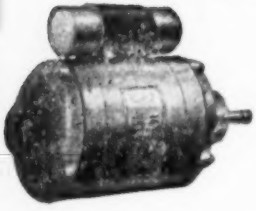

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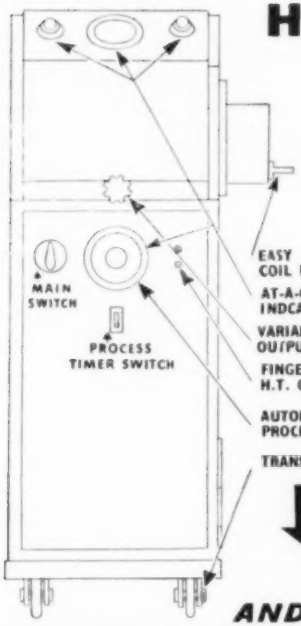

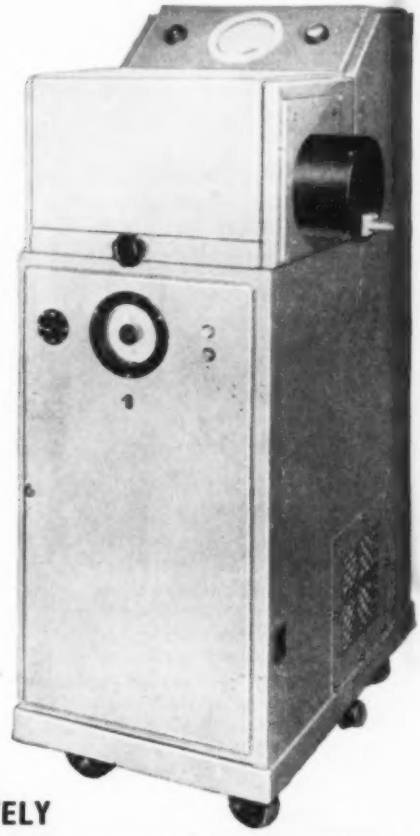

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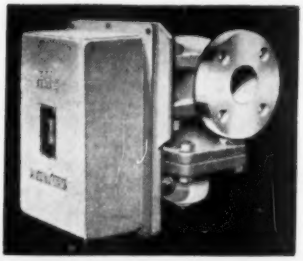

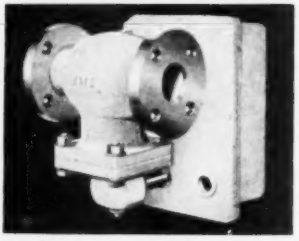

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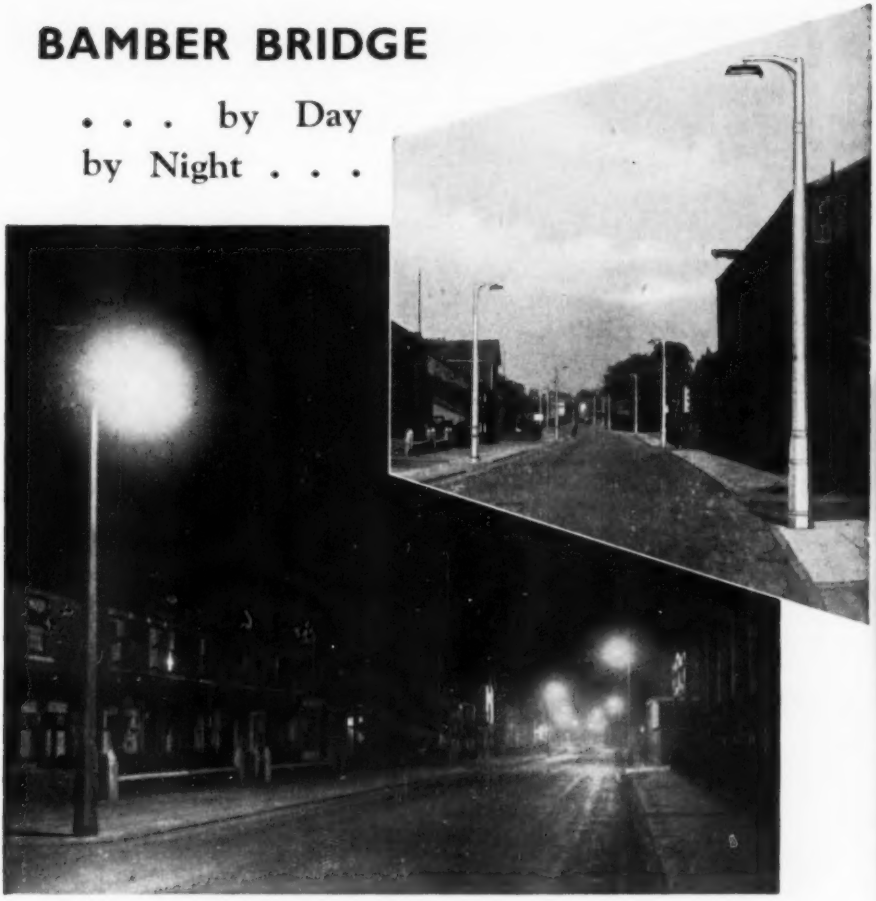

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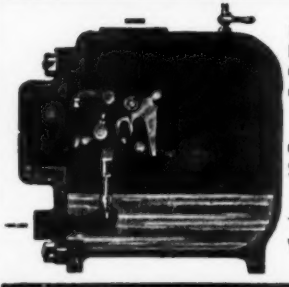

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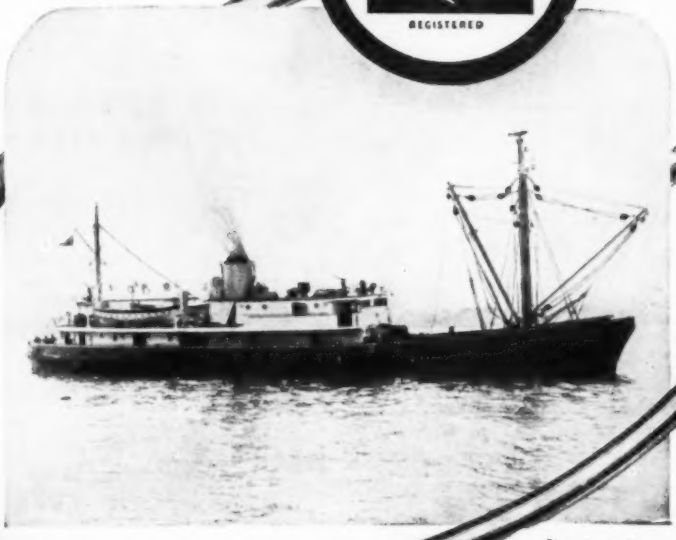

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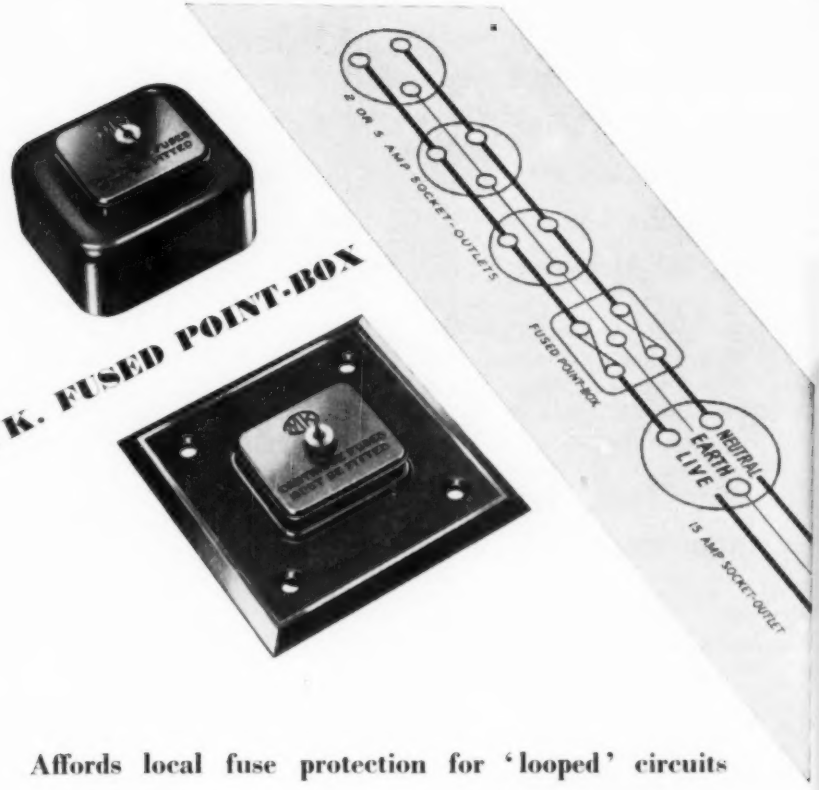

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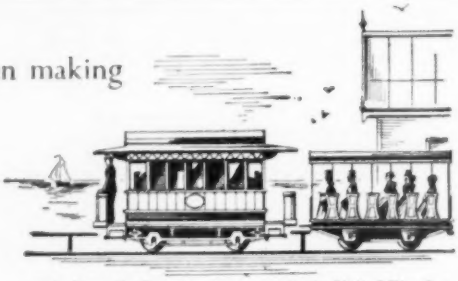

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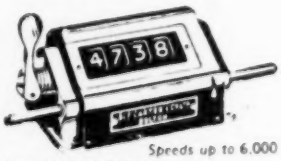

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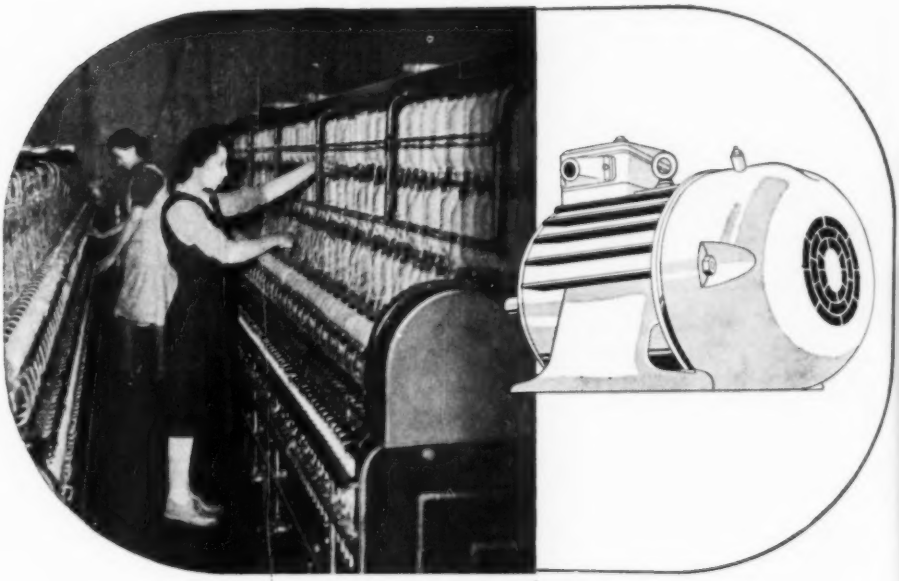

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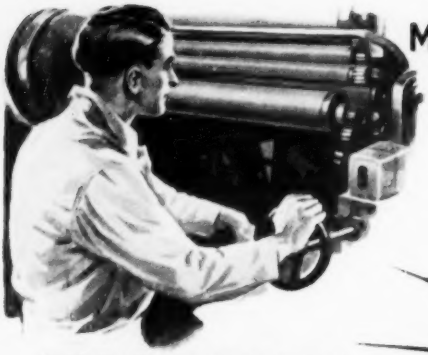

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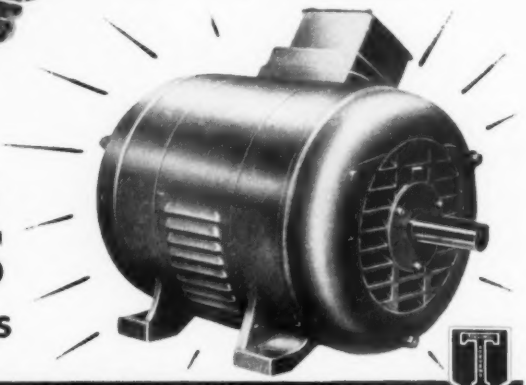

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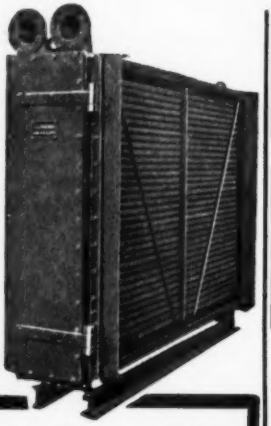

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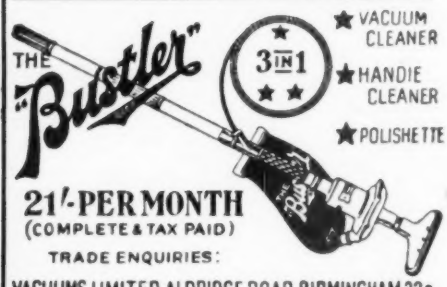

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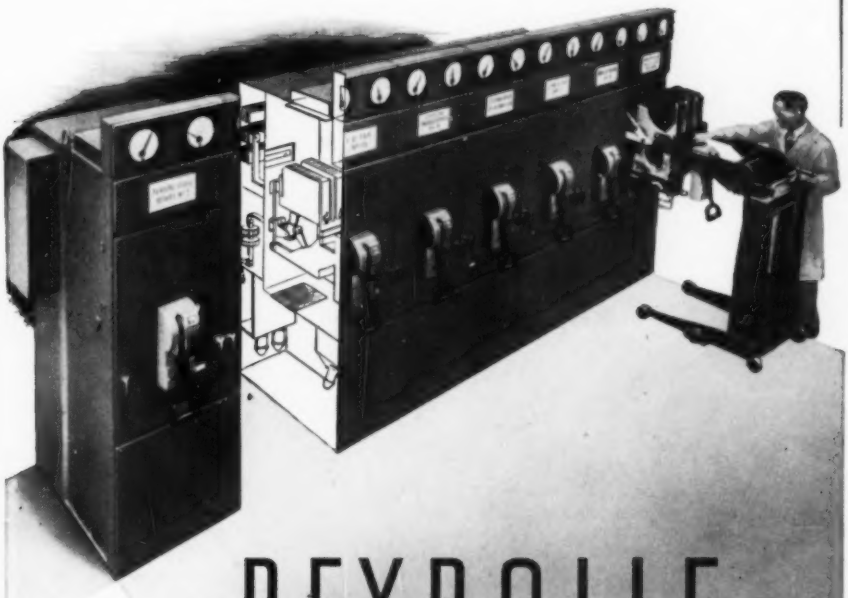

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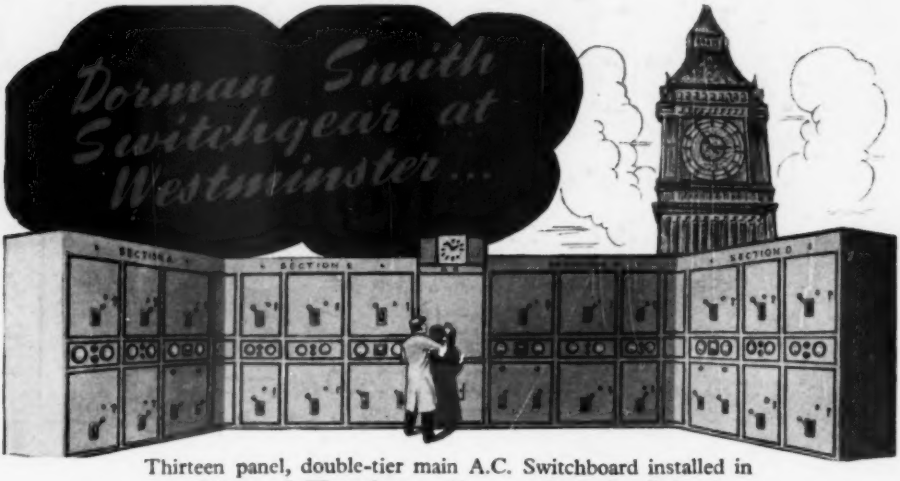

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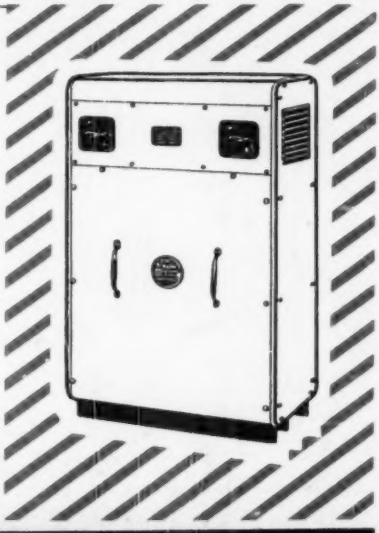

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